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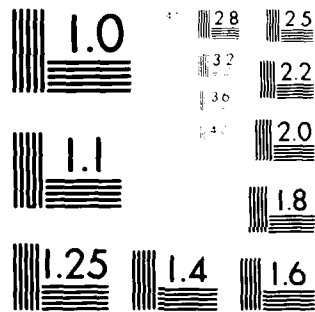
NEW JERSEY DEPT OF ENVIRONMENTAL PROTECTION TRENTON F/G 13/13
NATIONAL DAM SAFETY PROGRAM. POWDER MILL POND (NJ00803) PASSAIC--ETC(U)
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PASSAIC RIVER BASIN,
TRIBUTARY TO WHIPPANY RIVER
MORRIS COUNTY,
NEW JERSEY.

POWDER MILL POND

NJ 00803

DISC
DIRECTED
JUN 3 1981

PHASE 1 INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM.



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DEPARTMENT OF THE ARMY

Philadelphia District
Corps of Engineers
Philadelphia, Pennsylvania

Rept. no. DAEN/NAP - 53842/NJ00803 - 8/03

MARCH 1981

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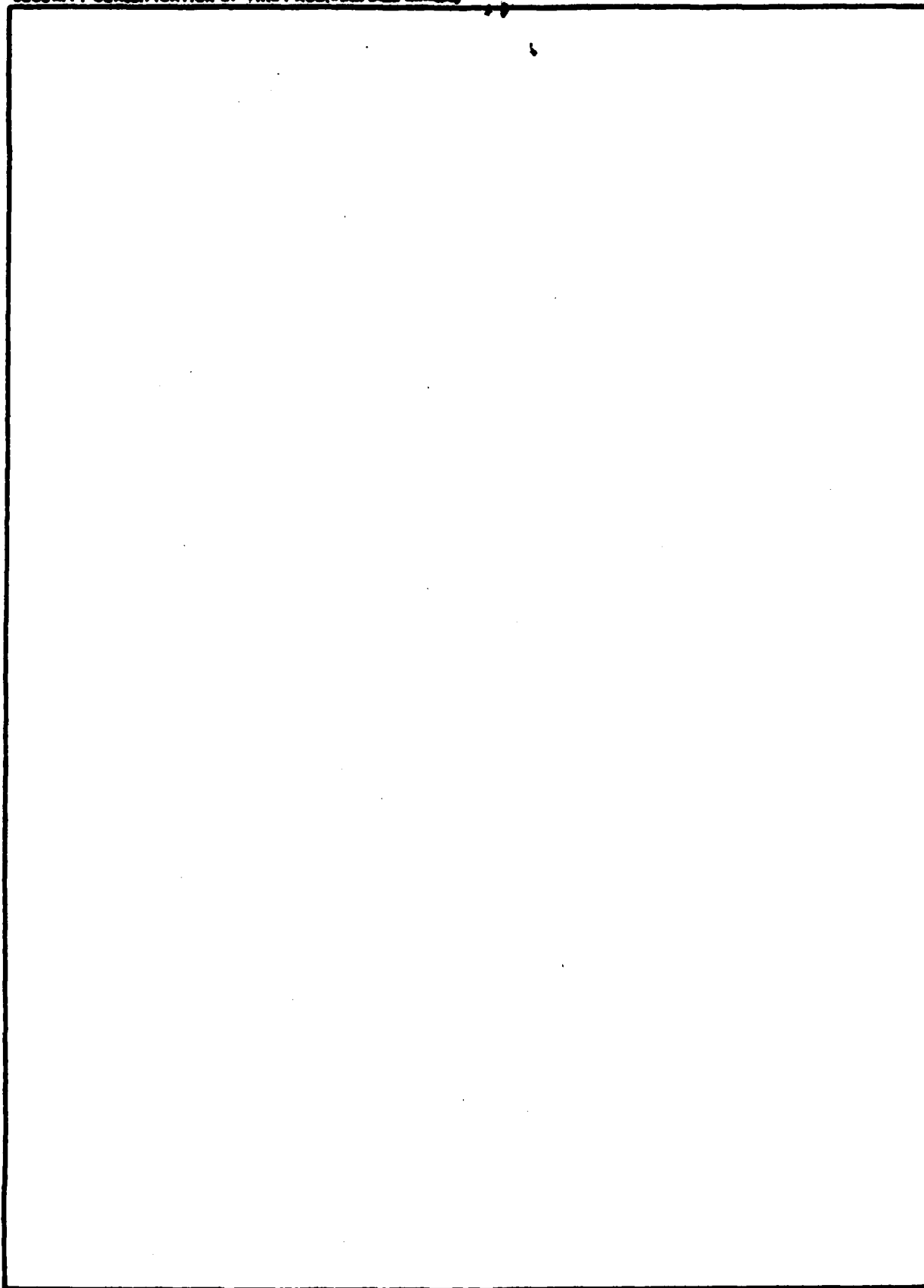
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Langan Engineering Assoc. Inc. 990 Clifton Ave. Clifton, NJ 07013		DACW61-79-C-0011
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NJ Department of Environmental Protection Division of Water Resources P.O. Box CNO29 Trenton, NJ 08625		
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Embankments	Powder Mill Pond Dam, N.J.	
Visual Inspection	Whippany River, N.J.	
Structural Analysis	Spillways	
	Embankments	
20. ABSTRACT (Continue on reverse side if necessary and identify by block number)		
<p>This report cites results of a technical investigation as to the dam's adequacy. The inspection and evaluation of the dam is as prescribed by the National Dam Inspection Act, Public Law 92-367. The technical investigation includes visual inspection, review of available design and construction records, and preliminary structural and hydraulic and hydrologic calculations, as applicable. An assessment of the dam's general condition is included in the report.</p>		

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NAPEN-N

DEPARTMENT OF THE ARMY
PHILADELPHIA DISTRICT, CORPS OF ENGINEERS
CUSTOM HOUSE—20 & CHESTNUT STREETS
PHILADELPHIA, PENNSYLVANIA 19106

22 MAY 1961

Honorable Brendan T. Byrne
Governor of New Jersey
Trenton, New Jersey 08621

Dear Governor Byrne:

Inclosed is the Phase I Inspection Report for Powder Mill Pond Dam in Morris County, New Jersey which has been prepared under authorization of the Dam Inspection Act, Public Law 92-367. A brief assessment of the dam's condition is given in the front of the report.

Based on visual inspection, available records, calculations and past operational performance, Powder Mill Pond Dam, a high hazard potential structure, is judged to be in fair overall condition. The spillway is considered seriously inadequate since a flow equivalent to 15 percent of the Probable Maximum Flood (PMF) would cause the dam to be overtopped. The seriously inadequate spillway is assessed as an UNSAFE, non-emergency condition, until more detailed studies prove otherwise or corrective measures are completed. The classification of UNSAFE applied to a dam because of a seriously inadequate spillway is not meant to indicate the same degree of emergency as would be associated with an UNSAFE classification applied for a structural deficiency. It does mean, however, that based on an initial screening, and preliminary computations, there appears to be a serious deficiency in spillway capacity so that if a severe storm were to occur, overtopping and failure of the dam could take place, significantly increasing the hazard of loss of life downstream from the dam. To ensure adequacy of the structure, the following actions, as a minimum, are recommended.

a. The spillway's adequacy should be determined by a qualified professional consultant engaged by the owner using more sophisticated methods, procedures and studies within three months from the date of approval of this report. Within three months of the consultant's findings remedial measures to ensure spillway adequacy should be initiated. In the interim, a detailed emergency operation plan and warning system should be promptly developed. Also, during periods of unusually heavy precipitation, around the clock surveillance should be provided.

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NAPEN-N

Honorable Brendan T. Byrne

b. The following remedial measures should be initiated within three months from the date of approval of this report:

(1) Perform additional investigation to determine seepage conditions through and under the embankment; provide horizontal drainage on the downstream face of the embankment if necessary.

(2) Perform additional investigation to determine the engineering properties of the embankment and foundation materials, and whether or not conventional safety margins exist under more severe stress conditions than those observed during our inspection, and what modifications may be required to achieve such safety margins.

c. The following remedial measures should be initiated within six months from the date of approval of this report:

(1) Repair undermining of the culvert footings and remove debris accumulating in the culvert, approach and discharge channels.

(2) Repair cracks existing in the concrete of the culvert approach walls and culvert.

d. The following remedial measures should be initiated within one year from the date of approval of this report:

(1) Provide proper slope protection on upstream slope of the embankment.

(2) Provide low level drawdown and additional spillway facilities for emergency and non-emergency purposes.

(3) Properly remove all trees and provide adequate filter coverage on the downstream face of the embankment to prevent any piping which may occur as a result of future root decay.

(4) Repair erosion resulting from footpaths on both upstream and downstream slopes.

e. The owner should develop written operating procedures and a periodic maintenance plan to ensure the safety of the dam within one year from the date of approval of this report.

A copy of the report is being furnished to Mr. Dirk C. Hofman, New Jersey Department of Environmental Protection, the designated State Office contact for this program. Within five days of the date of this letter, a copy will also be sent to Congresswoman Fenwick of the Fifth District. Under the provision of the Freedom of Information Act, the inspection report will be subject to release by this office, upon request, five days after the date of this letter.

NAPEN-N

Honorable Brendan T. Byrne

Additional copies of this report may be obtained from the National Technical Information Services (NTIS), Springfield, Virginia 22161 at a reasonable cost. Please allow four to six weeks from the date of this letter for NTIS to have copies of the report available.

An important aspect of the Dam Inspection Program will be the implementation of the recommendations made as a result of the inspection. We accordingly request that we be advised of proposed actions taken by the State to implement our recommendations.

Sincerely,

James G. Ton
for JAMES G. TON
Colonel, Corps of Engineers
District Engineer

1 Incl
As stated

Copies furnished:

Mr. Dirk C. Hofman, P.E., Deputy Director
Division of Water Resources
N.J. Dept. of Environmental Protection
P.O. Box CNO29
Trenton, NJ 08625

Mr. John O'Dowd, Acting Chief
Bureau of Flood Plain Regulation
Division of Water Resources
N.J. Dept. of Environmental Protection
P.O. Box CNO29
Trenton, NJ 08625

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POWDER MILL POND DAM (NJ00803)

CORPS OF ENGINEERS ASSESSMENT OF GENERAL CONDITIONS

This dam was inspected on 10 and 12 September and 3 December 1980 by Langan Engineering Associates, Inc. under contract to the State of New Jersey. The State, under agreement with the U.S. Army Engineer District, Philadelphia, had this inspection performed in accordance with the National Dam Inspection Act, Public Law 92-367.

Powder Mill Pond Dam, a high hazard potential structure, is judged to be in fair overall condition. The spillway is considered seriously inadequate since a flow equivalent to 15 percent of the Probable Maximum Flood (PMF) would cause the dam to be overtopped. The seriously inadequate spillway is assessed as an UNSAFE, non-emergency condition, until more detailed studies prove otherwise or corrective measures are completed. The classification of UNSAFE applied to a dam because of a seriously inadequate spillway is not meant to indicate the same degree of emergency as would be associated with an UNSAFE classification applied for a structural deficiency. It does mean, however, that based on an initial screening, and preliminary computations, there appears to be a serious deficiency in spillway capacity so that if a severe storm were to occur, overtopping and failure of the dam could take place, significantly increasing the hazard of loss of life downstream from the dam. To ensure adequacy of the structure, the following actions, as a minimum, are recommended.

a. The spillway's adequacy should be determined by a qualified professional consultant engaged by the owner using more sophisticated methods, procedures and studies within three months from the date of approval of this report. Within three months of the consultant's findings remedial measures to ensure spillway adequacy should be initiated. In the interim, a detailed emergency operation plan and warning system should be promptly developed. Also, during periods of unusually heavy precipitation, around the clock surveillance should be provided.

b. The following remedial measures should be initiated within three months from the date of approval of this report:

(1) Perform additional investigation to determine seepage conditions through and under the embankment; provide horizontal drainage on the downstream face of the embankment if necessary.

(2) Perform additional investigation to determine the engineering properties of the embankment and foundation materials, and whether or not conventional safety margins exist under more severe stress conditions than those observed during our inspection, and what modifications may be required to achieve such safety margins.

c. The following remedial measures should be initiated within six months from the date of approval of this report:

(1) Repair undermining of the culvert footings and remove debris accumulating in the culvert, approach and discharge channels.

(2) Repair cracks existing in the concrete of the culvert approach walls and culvert.

d. The following remedial measures should be initiated within one year from the date of approval of this report:

(1) Provide proper slope protection on upstream slope of the embankment.

(2) Provide low level drawdown and additional spillway facilities for emergency and non-emergency purposes.

(3) Properly remove all trees and provide adequate river coverage on the downstream face of the embankment to prevent any undermining which may occur as a result of future root decay.

(4) Repair erosion resulting from footpaths on both upstream and downstream slopes.

e. The owner should develop written operating procedures and a periodic maintenance plan to ensure the safety of the dam within one year from the date of approval of this report.

APPROVED:

James G. Ton
for JAMES G. TON

Colonel, Corps of Engineers
District Engineer

DATE:

22 May 1981



DEPARTMENT OF THE ARMY
PHILADELPHIA DISTRICT, CORPS OF ENGINEERS
CUSTOM HOUSE--2 D & CHESTNUT STREETS
PHILADELPHIA, PENNSYLVANIA 19106

IN REPLY REFER TO
NAPEN-N

20 MAY 1981

Honorable Brendan T. Byrne
Governor of New Jersey
Trenton, NJ 08621

Dear Governor Byrne:

This is in reference to our ongoing National Program for Inspection of Non-Federal Dams within the State of New Jersey. Powder Mill Pond Dam (Federal I.D. No. NJ00803), a high hazard potential structure, has recently been inspected. The dam is owned by the New Jersey Transit Corporation, and is located on a tributary of the Whippany River in Mount Tabor, Morris County.

Using Corps of Engineers screening criteria, it has been determined that the dam's spillway is seriously inadequate because a flow equivalent to 29 percent of the Probable Maximum Flood would cause the dam to be overtopped. The seriously inadequate spillway is assessed as an UNSAFE, non-emergency condition, until more detailed studies prove otherwise, or corrective measures are completed. The classification of UNSAFE applied to a dam because of a seriously inadequate spillway is not meant to indicate the same degree of emergency as would be associated with an UNSAFE classification applied for a structural deficiency. It does mean, however, that based on an initial screening and preliminary computations, there appears to be a serious deficiency in spillway capacity so that if a severe storm were to occur, overtopping and failure of the dam could take place, significantly increasing the hazard potential to loss of life downstream from the dam. As a result of this UNSAFE determination, it is recommended that the dam's owners take the following measures within 30 days of the date of this letter:

a. Engage the services of a qualified professional consultant to more accurately determine the spillway adequacy by using more detailed and sophisticated hydrologic and hydraulic analyses, and to recommend any remedial measures required to prevent overtopping of the dam.

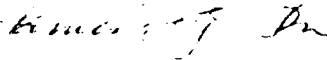
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Honorable Brendan T. Byrne

b. In the interim, a detailed emergency operation plan and downstream warning system should be promptly developed. Also, around the clock surveillance should be provided during periods of unusually heavy precipitation.

A final report on this Phase I inspection will be forwarded to you within two months.

Sincerely,



JAMES G. TON
Colonel, Corps of Engineers
District Engineer

Copies Furnished:

Mr. Dirk C. Hofman, P.E., Deputy Director
Division of Water Resources
N.J. Dept. of Environmental Protection
P.O. Box CN029
Trenton, NJ 08625

Mr. John O'Dowd, Acting Chief
Bureau of Flood Plain Regulation
Division of Water Resources
N.J. Dept. of Environmental Protection
P.O. Box CN029
Trenton, NJ 08625

UNSAFE DAM

NATIONAL PROGRAM OF INSPECTION OF DAMS

a. NAME: Powder Mill Pond b. ID NO.: NJ00803 c. LOCATION State: New Jersey, County: Morris.

d. HEIGHT: 35 feet e. MAXIMUM IMPOUNDMENT CAPACITY: 212 ac. ft. River or Stream: Tributary of Whippany River

f. TYPE: Earthfill, Railroad Embankment g. OWNER: New Jersey Transit Corporation Nearest D/S City or Town: Mount Tabor

h. DATE GOVERNOR NOTIFIED OF UNSAFE CONDITIONS: 21 May 1981

i. URGENCY CATEGORY: High Hazard, UNSAFE, Non-Emergency.

j. EMERGENCY ACTIONS TAKEN:
Gov. notified of this condition by District Engineer's letter of 21 May 1981.

k. REMEDIAL ACTIONS TAKEN:
N.J.D.E.P. will notify dam's owner upon receipt of our letter.

l. REMARKS: Final report, to be issued within six weeks, will have WHITE cover.

m. CONDITION OF DAM RESULTING IN UNSAFE ASSESSMENT:
Preliminary report calculations indicate 15% of the PMF would overtop the dam.

n. DESCRIPTION OF DANGER INVOLVED: High Hazard potential, overtopping and failure of the dam would significantly increase hazard potential to loss of life and property downstream of dam.

o. RECOMMENDATIONS GIVEN TO GOVERNOR:
Within 30 days of the date of the District Engineer's letter the owner should do the following:
a. Engage the services of a qualified professional consultant to more accurately determine the spillway adequacy by using more detailed and sophisticated hydrologic and hydraulic analyses, and to recommend any remedial measures required to prevent overtopping of the dam.
b. In the interim, a detailed emergency operation plan and downstream warning system should be developed. Also, around the clock surveillance should be provided during periods of unusually heavy precipitation.

T.B. Heverin
T.B. HEVERIN, Coordinator
Dam Inspection Program
U.S.A.E.D., Philadelphia

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM

NAME OF DAM:	POWDER MILL POND
ID NUMBER:	FED ID No NJ 00803
STATE LOCATED:	NEW JERSEY
COUNTY LOCATED:	MORRIS
STREAM:	TRIBUTARY TO WHIPPANY RIVER
RIVER BASIN:	HUDSON RIVER
DATE OF INSPECTION:	SEPTEMBER & DECEMBER 1980

ASSESSMENT OF GENERAL CONDITIONS

The embankment bordering the east side of Powder Mill Pond appears to have been constructed as a railroad embankment and may not have been designed as a dam. However, significant amounts of water could be impounded by the embankment during periods of unusually heavy precipitation. The ability of the embankment to withstand stresses and seepage conditions induced by higher than normal water levels in Powder Mill Pond and the future performance of the embankment is uncertain. The arched culvert which allows water to flow through the embankment is in a deteriorated condition. There is water flowing from the toe and from the base of the vertical stone block wall on the downstream side of the embankment. The surficial soils of the embankment are in a loose condition. No riprap or other slope protection was observed and erosion has occurred in numerous areas of the embankment. There is essentially no available information concerning the design, construction or subsequent modifications of the embankment. Additional investigation is necessary to adequately evaluate the future performance of the embankment.

The spillway capacity as determined by the Corps of Engineers Screening criteria is "seriously inadequate". The embankment can adequately pass only 14% of the PMF. The spillway adequacy should be determined using more precise and sophisticated methods and procedures.

The following measures are recommended to be taken very soon:

Perform additional investigation to determine seepage conditions through and under the embankment, provide horizontal drainage on the downstream face of the embankment if necessary. Perform additional investigation to determine the engineering properties of the embankment and foundation materials, and whether or not conventional safety margins exist under more severe stress

conditions than those observed during our inspection, and what modifications may be required to achieve such safety margins. The spillway capacity of the embankment is "seriously inadequate" as defined in the Corps of Engineers ETL 1110-2-234. The need for and type of mitigating measures should be determined, around-the-clock surveillance during periods of unusual heavy precipitation provided and a warning system established.

The following measures are recommended to be taken soon:

Repair undermining of the culvert footings and remove debris accumulating in the culvert, approach and discharge channels. Repair cracks existing in the concrete of the culvert approach walls and culvert.

The following measures are recommended to be taken in the near future:

Provide proper slope protection on upstream slope of the embankment. Provide low level drawdown and additional spillway facilities for emergency and non-emergency purposes. Properly remove all trees and provide adequate filter coverage on the downstream face of the embankment to prevent any piping which may occur as a result of future root decay. Repair erosion resulted from footpaths in both upstream and downstream slopes.


K. Peter Yu, P.E.



OVERALL VIEW
POWDER MILL POND
AND
RAILROAD EMBANKMENT
10 September 1980

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM

NAME OF DAM:	POWDER MILL POND
ID NUMBER:	FED ID No NJ 00803
STATE LOCATED:	NEW JERSEY
COUNTY LOCATED:	MORRIS
STREAM:	TRIBUTARY TO WHIPPANY RIVER
RIVER BASIN:	HUDSON RIVER
DATE OF INSPECTION:	SEPTEMBER & DECEMBER 1980



LANGAN ENGINEERING ASSOCIATES, INC.

Consulting Civil Engineers
990 CLIFTON AVENUE
CLIFTON, NEW JERSEY
201-472-9366

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NATIONAL DAM SAFETY REPORT
POWDER MILL POND FED ID NO NJ 00803

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PREFACE

This report is prepared under guidance contained in the Recommended Guidelines for Safety Inspection of Dams, for Phase I Investigations. Copies of these guidelines may be obtained from the Office of Chief of Engineers, Washington, D. C. 20314. The purpose of a Phase I Investigation is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general condition of the dam is based upon available data and visual inspections. Detailed investigation, and analyses involving topographic mapping, subsurface investigations, testing, and detailed computational evaluations are beyond the scope of a Phase I investigation; however, the investigation is intended to identify any need for such studies.

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team. It is important to note that the condition of a dam depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Only through continued care and inspection can there be any chance that unsafe conditions be detected.

Phase I inspections are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established Guidelines, the Spillway Test flood is based on the estimated "Probable Maximum Flood" for the region (greatest reasonably possible storm runoff), or fractions thereof. The test flood provides a measure of relative spillway capacity and serves as an aide in determining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition and the downstream damage potential.

SECTION I PROJECT INFORMATION

1.1 General

Authority to perform the Phase I Safety Inspection of Powder Mill Pond was received from the State of New Jersey, Department of Environmental Protection, Division of Water Resources by letter dated 12 August 1980. This Authority was given pursuant to the National Dam Inspection Act, Public Law 92-367 and by agreement between the State and the US Army Engineers District, Philadelphia.

The purpose of the Phase I Investigation is to develop an assessment of the general conditions with respect to safety of Powder Mill Pond and appurtenances based upon available data and visual inspection, and determine any need for emergency measures and conclude if additional studies, investigations and analyses are necessary and warranted. The assessment is made using screening criteria established in Recommended Guidelines for Safety Inspection of Dams prepared by the Department of Army, Office of the Chief of Engineers. It is not the purpose of the inspection report to imply that a dam meeting or failing to meet the screening criteria is, per se, certainly adequate or inadequate.

1.2 Description of Project

a. Description of Dam and Appurtenances

Powder Mill Pond is bordered along the east side by approximately 660 ft of a 2 track railroad embankment. The top of the embankment is about 11 feet above the normal pond surface and about 35 feet at its highest point above natural ground surface on the downstream side. The upstream and downstream slopes of the embankment vary between 2H:1V earthfill to vertical stone block retaining walls. The retaining walls vary in height from a few feet to about 20 feet. There is a 6 ft wide by 7 to 10 ft high culvert through the railroad embankment at the south end of the pond. There is no spillway associated with the pond or railroad embankment. The railroad embankment and south end of the pond is crossed by a one lane road (Powder Mill Pond Road). The road crosses the pond on an earthfill causeway. Water in the pond is allowed to pass through the causeway to the railroad embankment culvert by means of three 36-in-dia concrete pipes. There are no other outlets associated with the pond to our knowledge other than the 3 pipes and culvert.

b. Location

Powder Mill Pond is located in Mount Tabor, Morris County, New Jersey. Powder Mill Pond Road, which is located off Tabor Road (Rt 53) crosses the embankment and south end of the pond. It is at north latitude 40°52.0' and west longitude 74°28.7'. A regional vicinity map is given in Figure 1.

c. Size Classification

Powder Mill Pond is classified as small based on its maximum storage capacity of approximately 212 ac ft which is more than 50 ac ft but less than 1,000 ac ft. It is classified as small based on the railroad embankment maximum height of 35 feet which is less than 40 feet. Accordingly, Powder Mill Pond is classified as "small" in size.

d. Hazard Classification

Powder Mill Pond is classified as having a "High Hazard Potential" in the National Inventory of Dams on the basis that failure of the railroad embankment would cause excessive property damage to residences downstream and could potentially cause more than a few deaths. Visual inspection revealed a large number of homes and structures along the downstream channel and the use of the embankment by commuter train; both of which could be seriously affected in the event of a failure of the railroad embankment. It is, therefore, proposed to keep the Hazard Potential Classification as "High".

e. Ownership

Ownership of the railroad embankment is by New Jersey Transit Corp., Macarter Highway & Market Street, P. O. Box 10009, Newark, New Jersey 07101.

f. Purpose of Dam

The purpose of the dam structure is an embankment track bed for an active railroad. Powder Mill Pond is used for recreation.

g. Design and construction History

There is no information available on the design and construction history of the railroad embankment.

h. Normal Operational Procedures

There are no known operational procedures for the regulation of water flow from Powder Mill Pond.

1.3 Pertinent Data

a.	<u>Drainage Areas</u>	1.66 sq. mi.
b.	<u>Discharge at Damsite</u>	
	Maximum known flood at damsite	unknown
c.	<u>Elevation</u> (Arbitrary - El 100.0 top of concrete retaining wall over culvert)	
	Top Dam	102.13 (low point at south end)
	Normal pool	Approx 92
	Spillway crest	No Spillway
	Maximum tailwater	Unknown

- | | | |
|----|----------------------------------|---|
| d. | <u>Reservoir</u> | |
| | Length of maximum pool | Approx 1800 ft |
| | Length of normal pool | Approx 1000 ft |
| e. | <u>Storage (acre-feet)</u> | |
| | Normal pool | Approx 96 ac ft |
| | Top of railroad embankment | Approx 212 ac ft |
| f. | <u>Reservoir Surface (acres)</u> | |
| | Top of railroad embankment | Approx 15.3 |
| | Normal pool | Approx 8.0 |
| | Spillway crest | N/A |
| g. | <u>Dam</u> | |
| | Type | Earthfill railroad embankment |
| | Length | 660 ft |
| | Height | Approx 35 ft |
| | Top Width | 25 ft |
| | Side Slopes | Variable (2H:1V to vertical) |
| | Zoning | Unknown |
| | Impervious Core | Unknown |
| | Cutoff | Unknown |
| | Grout curtain | Unknown |
| h. | <u>Spillway</u> | No spillway |
| i. | <u>Regulating Outlets</u> | 6 ft wide by 7 to 10 ft high masonry arched culvert under railroad embankment. No controlled outlets. |

SECTION 2 ENGINEERING DATA

There is no information available concerning the design or construction of the railroad embankment. There are no operational procedures concerning the railroad embankment with respect to water levels in Powder Mill Pond.

SECTION 3 VISUAL INSPECTION

Our visual inspection of the Powder Mill Pond revealed the east side of the pond is bordered by a 2 track railroad embankment which at its low point was approximately 10 1/2 ft higher than the pond water level at the time of the inspection. The embankment and pond are crossed at the southern end by Powder Mill Pond Road which is supported by an earthen causeway. The low point of the causeway is only 1 to 2 ft above normal pool level. Under this portion of the causeway are three 36-in-dia concrete pipes through which water discharges and flows along the west side of the railroad embankment to a 6 ft wide, 7 to 10 foot high arched stone and masonry culvert through the railroad embankment. On the east side of the embankment water runs down a steep slope formed by rock outcrop to a stream bed approximately 20 feet below.

The upstream and downstream slopes of the railroad embankment vary from maximum of approximately 2H:1V to vertical stone block and concrete retaining walls. The slopes are vegetated with brush and small diameter trees below the ballast line of the railroad tracks. There is seepage of water running from the toe and from the base of the stone block retaining wall on the downstream side. The seepage appeared to be clear at the time of the inspection. The surficial soil on the slopes is generally in an uncompacted state. Walking on the slopes leaves footprints and depressions in many areas. There are many areas of surficial erosion along the embankment slopes.

The upstream railroad embankment is protected from erosion for approximately 60 ft north of the culvert by a vertical concrete retaining wall. There is a horizontal crack along most of the length of this wall which has experienced about 2 inches of translational movement. No protective riprap was observed along the upstream embankment.

The culvert which passes under the railroad embankment is constructed of various materials. The middle section of the culvert, approximately 23 ft long, is constructed of vertical stone block walls to the springline with a brick arch. To both ends of this has been added approximately 7 ft long reinforced concrete culvert sections of the same cross sectional dimensions. The concrete sections are supported on stone foundations. The date 1902 is inscribed in the concrete which appears to be the date of the extensions.

Inspection of the culvert shows that the stream has extensively eroded and undermined the stone foundations of the culvert walls. The concrete arch is severely cracked. No mortar was observed in the joints of the stone block. There are railroad ties, plywood, dead branches and other debris in the culvert.

There are approximately 6 homes along the southwestern side of Powder Mill Pond. The homes appear to be built at or above the elevation of the top of the railroad embankment. The remaining shore areas are swamp and woodlands.

The downstream channel from the east side culvert outlet is a steep rock outcrop streambed dropping approximately 30 feet in a distance of less than 500 ft to a streambed formed between NJ Rt 53 and the railroad embankment.

SECTION 4 OPERATIONAL PROCEDURES

There are no operational procedures for Powder Mill Pond. Maintenance of the railroad embankment is by Conrail, Inc. and the New Jersey Transit Corp.

SECTION 5 HYDRAULICS/HYDROLOGIC

Powder Mill Pond is bordered along its east side by a railroad embankment. Water discharges through three concrete pipes under the causeway and flows along the upstream toe of the embankment to a stone and masonry arched culvert passing through the embankment. This is, to our knowledge, the only outlet for the pond water.

The hydraulic/hydrologic evaluation is based on a Spillway Design Flood (SDF) equal to the Probable Maximum Flood chosen in accordance with the evaluation guidelines for dams classified as high hazard and small in size. Hydrologic design data for the embankment was not available. The PMF has been determined by developing a synthetic hydrograph based on the maximum probable precipitation of 22.2 inches (200 sq. mi. -24 hour). The Corps of Engineers has recommended the use of the SCS triangular unit hydrograph with the curvilinear transformation. Hydrologic computations are presented in Appendix 3. The PMF peak inflow determined for the subject watershed is 5005 cfs.

The capacity of the culvert at maximum pool elevation at the top of the railroad embankment is estimated to be 528 cfs which is significantly less than the SDF. Flood routing for the 1/2 PMF and PMF indicates the railroad embankment will overtop by 1.04 ft and 1.86 ft, respectively. We estimate the culvert can adequately pass only 14% of the PMF. Based on our knowledge of the dam as an earthfill railroad embankment and our knowledge of the degree of overtopping potential, it is our opinion that overtopping by the 1/2 PMF would likely cause failure.

The immediate potential damage center is located at the embankment on which active commuter trains travel. The downstream potential damage center, which is approximately 1500 ft from the embankment, is comprised of Rt 53 and numerous homes and structures located along the stream for a distance of about a mile. Based on the above observations it is our opinion that failure of the railroad embankment from overtopping would significantly increase the hazard potential for economic loss and loss of life downstream of the embankment from that which would exist just before overtopping failure. Therefore, the spillway capacity of Powder Mill Pond Dam is considered to be "seriously inadequate" as defined in the Corps of Engineers ETL 1110-2-234.

There is, to our knowledge, no drawdown structure associated with the pond.

SECTION 6 STRUCTURAL STABILITY

The embankment to the east of Powder Mill Pond appears to have been intended for use as a railroad embankment and not to perform as an earth dam. Based on visual observation, no immediate instability appears to exist in the railroad embankment under normal conditions. However, downstream seepage, deteriorated retaining walls and culvert structures exist and can lead to serious structural stability problems if deficiencies are uncorrected. The embankment has the potential to impound significant amounts of water during periods of unusually heavy precipitation. Vibration induced by the active commuter trains presents additional unfavorable conditions. The structural stability of the embankment under such conditions are uncertain and are probably unsatisfactory.

There are no design or construction data available concerning the construction of the railroad embankment or subsequent modifications, consequently analysis of the degree of stability of the embankment cannot be made without gross assumptions concerning the engineering properties of the embankment and foundation materials.

There are no operating records of the railroad embankment pertaining to Powder Mill Pond.

The track bed appears to have been widened about 1902 as judged by the different materials used in construction of the culvert and the date inscribed in the concrete of the culvert. The structural adequacy of the culvert and upstream wingwall may not be satisfactory as evidenced by the severely cracked concrete of these structures and should be further evaluated.

The railroad embankment is located in Seismic Zone I of the Seismic Zone Map of Contiguous States. The degree of stability of the embankment under static loading is uncertain and may be unstable under earthquake loading.

SECTION 7 ASSESSMENT, RECOMMENDATIONS/REMEDIAL MEASURES

7.1 Dam Assessment

The embankment bordering the east side of Powder Mill Pond appears to have been constructed as a railroad embankment and may not have been designed as a dam. However, significant amounts of water could be impounded by the embankment during periods of unusually heavy precipitation. The ability of the embankment to withstand stresses and seepage conditions induced by higher than normal water levels in Powder Mill Pond and the future performance of the embankment is uncertain. The arched culvert which allows water to flow through the embankment is in a deteriorated condition. There is water flowing from the toe and from the base of the vertical stone block wall on the downstream side of the embankment. The surficial soils of the embankment are in a loose condition. No riprap or other slope protection was observed and erosion has occurred in numerous areas of the embankment.

There is essentially no available information concerning the design, construction or subsequent modifications of the embankment. Additional investigation is necessary to adequately evaluate the future performance of the embankment.

The spillway capacity as determined by the Corps of Engineers Screening criteria is "seriously inadequate". The embankment can adequately pass only 14% of the PMF. The spillway adequacy should be determined using more precise and sophisticated methods and procedures.

7.2 Recommendations/Remedial Measures

The following measures are recommended to be taken very soon:

1. Perform additional investigation to determine seepage conditions through and under the embankment; provide horizontal drainage on the downstream face of the embankment if necessary.
2. Perform additional investigation to determine the engineering properties of the embankment and foundation materials, and whether or not conventional safety margins exist under more severe stress conditions than those observed during our inspection, and what modifications may be required to achieve such safety margins.
3. The spillway capacity of the embankment is "seriously inadequate" as defined in the Corps of Engineers ETL 1110-2-234. The need for and type of mitigating measures should be determined, around-the-clock surveillance during periods of unusual heavy precipitation provided and a warning system established.

The following measures are recommended to be taken soon:

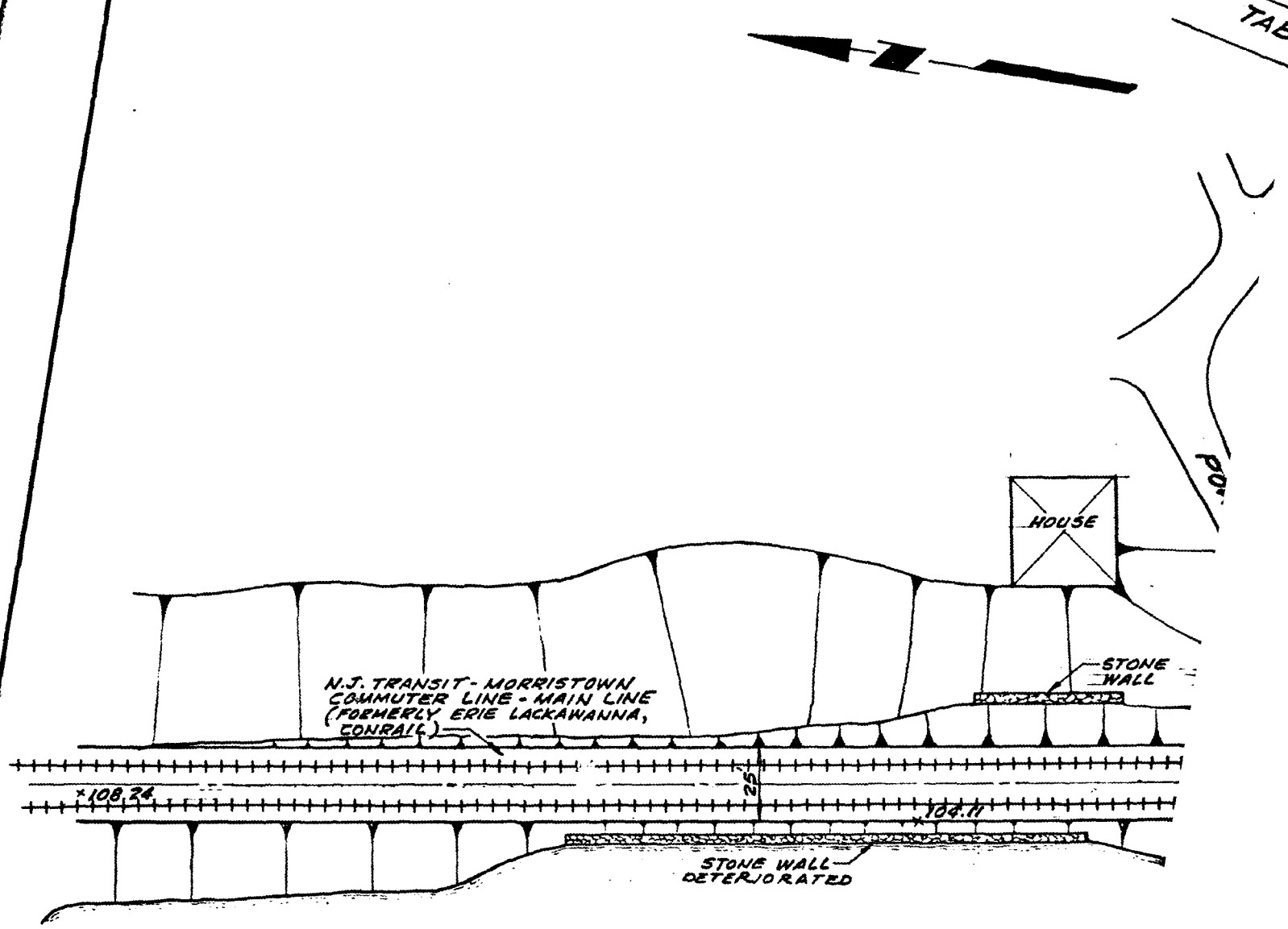
1. Repair undermining of the culvert footings and remove debris accumulating in the culvert, approach and discharge channels.
2. Repair cracks existing in the concrete of the culvert approach walls and culvert.

The following measures are recommended to be taken in the near future:

1. Provide proper slope protection on upstream slope of the embankment.
2. Provide low level drawdown and additional spillway facilities for emergency and non-emergency purposes.
3. Properly remove all trees and provide adequate filter coverage on the downstream face of the embankment to prevent any piping which may occur as a result of future root decay.
4. Repair erosion resulted from footpaths on both upstream and downstream slopes.

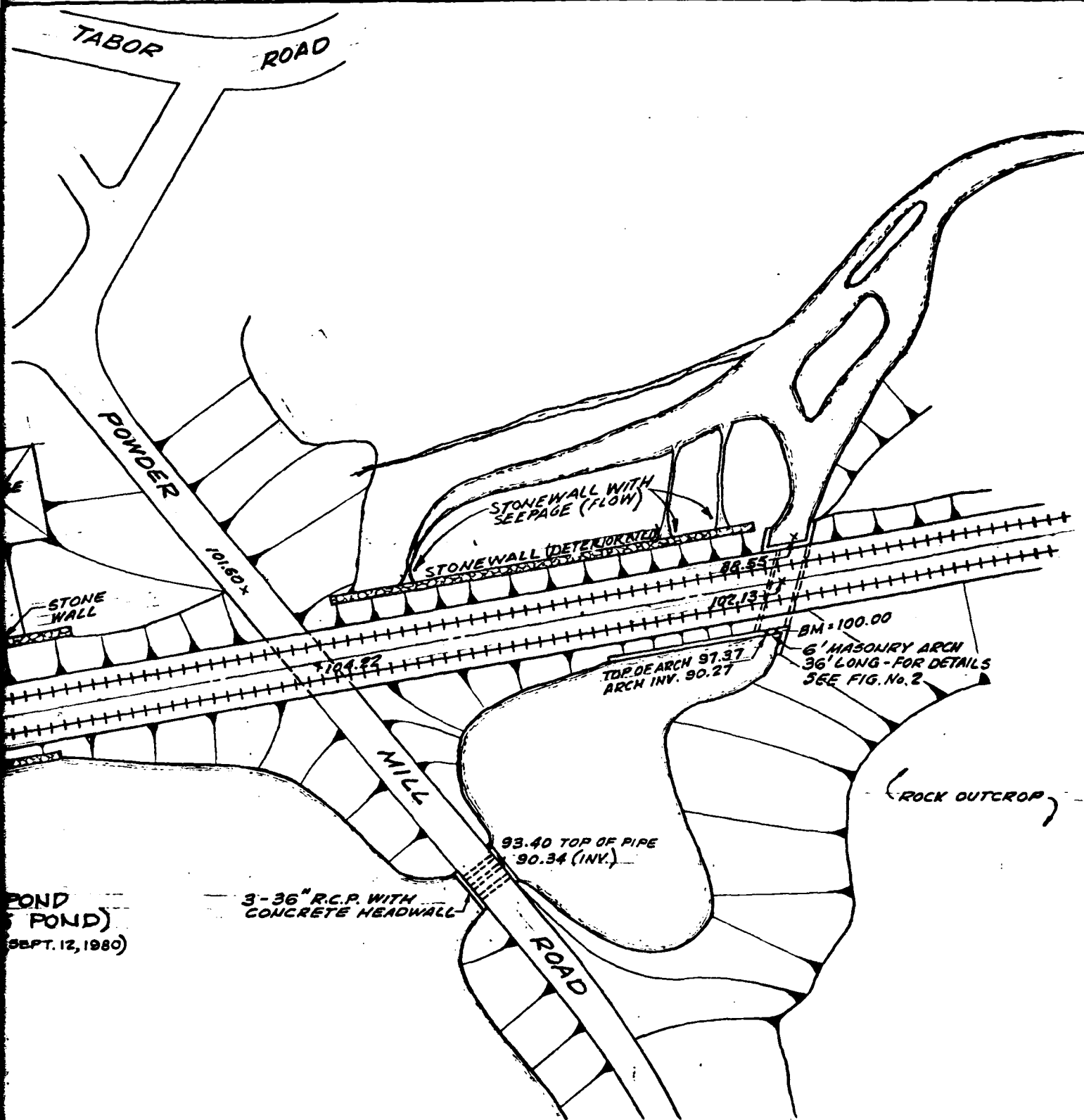
FIGURES

TAB



POWDER MILL POND
(FORMERLY HOWELL'S POND)
W.S. 91.85 ± (SEPT. 12, 1980)

NOTE
EWT2500228



POND
(POND)
SEPT. 12, 1980

NOTE:

FIGURE ADAPTED FROM DRAWING
"ERIE-LACKAWANNA R.R., MORRIS
AND ESSEX DIVISION, MAIN LINE,
MORRIS COUNTY, PASSIPPANY-
TROY HILLS TOWNSHIP, STATE
BOARD OF TAXES & ASSESSMENT"
DATED FEBRUARY, 1928.
ARBITRARY B.M. OF EL. 100.00 ON TOP OF
ARCH WALL ABOVE CULVERT WAS USED
FOR FIELD SPOT CHECK

**PLAN OF RAILROAD EMBANKMENT
AND APPURTENANCES
POWDER MILL POND**

MT. TABOR

MORRIS COUNTY, N.J.

LANGAN ENGINEERING ASSOCIATES, INC.

990 CLIFTON AVENUE CLIFTON, N.J. 07013

DRN. BY: R.D.

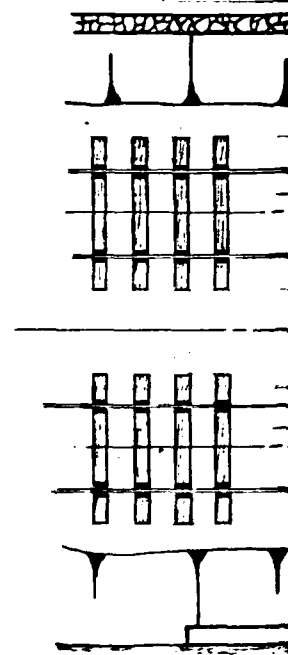
SCALE: 1" = 50' ±

JOB No. 80145

CK'D. BY: V.U.

DATE: 9-17-80

FIG. No. 2



PROFILE THRU 6' MASONRY ARCH CULVERT
SCALE: 1"=10' ±

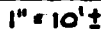


FIG. No. 3

APPENDIX 1

CHECK LIST, HYDROLOGIC AND HYDRAULIC DATA

CHECK LIST, VISUAL INSPECTION

CHECK LIST
HYDROLOGIC AND HYDRAULIC DATA
ENGINEERING DATA

DRAINAGE AREA CHARACTERISTICS: 1.66 sq. mi., wooded & forest land

ELEVATION TOP NORMAL POOL (STORAGE CAPACITY): E1 92[±] (96 ac ft)

ELEVATION TOP MAXIMUM POOL (STORAGE CAPACITY): Approx E1 102 (212 ac ft)

ELEVATION MAXIMUM DESIGN POOL: Unknown

ELEVATION TOP RAILROAD EMBANKMENT: 102.12, low point

CREST: of Railroad Embankment

- a. Elevation 102.13, low point
- b. Type Earth Embankment
- c. Width 25 ft +
- d. Length 660 ft
- e. Location Spillover None
- f. Number and Type of Gates None

OUTLET WORKS: Culvert

- a. Type 6 ft wide, 7 ft high masonry & stone arched culvert
- b. Location South end of RR embankment
- c. Entrance inverts 90.3[±]
- d. Exit inverts 88.5[±]
- e. Emergency draindown facilities None

HYDROMETEOROLOGICAL GAGES: None

- a. Type _____
- b. Location _____
- c. Records _____

MAXIMUM NON-DAMAGING DISCHARGE: Unknown

NOTE: All Elevations based on arbitrary datum.

Check List
Visual Inspection
Phase 1

Name Dam Powder Mill Pond County Morris State New Jersey Coordinators NJ DEP

Date(s) Inspection 10 Sep 1980 Weather Clear Temperature Mid 70's

Pool Elevation at Time of Inspection 91.85* MGSX. Tailwater at Time of Inspection 88.55* M.S.L.
*Elevation referenced to arbitrary datum of 100 at top of concrete retaining wall over culvert (see Fig. 2)

Inspection Personnel:

Richard W. Greene (LEA) 10 Sep & 12 Sep 1980 Dennis J. Leary (LEA) 3 Dec 1980
Larry Lindgren (NJ DEP) 10 Sep 1980 V. Urban (LEA) 12 Sep 1980 K. Peter Yu (LEA) 3 Dec 1980
Brian Mulvenna (AC of E) 10 Sep 1980

R. W. Greene Recorder

EMBANKMENT

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SURFACE CRACKS	NONE OBSERVED	
UNUSUAL MOVEMENT OR CRACKING AT OR BEYOND THE TOE	NONE OBSERVED	
SLOUGHING OR EROSION OF EMBANKMENT AND ADJUTENT SLOPES	EROSION WHERE PATHS HAVE BEEN MADE ON BOTH UPSTREAM AND DOWNSTREAM EMBANKMENTS. EMBANKMENT MATERIAL LOOSE, LEFT FOOT PRINTS 2 TO 3 INCHES DEEP IN PLACES	REPAIR EROSION.
VERTICAL AND HORIZONTAL ALIGNMENT OF THE CREST	STRAIGHT, APPROX 25 FT WIDE 2 TRACK, ACTIVE RAILROAD	
RIPRAP FAILURES	NO RIPRAP SEEN. 2 VERTICAL UNMORTARED FIELD STONE WALLS OBSERVED. 1 UPSTREAM FACE, 1 DOWNSTREAM FACE. OCCASIONAL BLOCKS MISSING FROM TOP OF WALL.	PROVIDE PROPER PROTECTION ON UPSTREAM SLOPE OF EMBANKMENT.

EMBANKMENT

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
	UPSTREAM AND DOWNSTREAM EMBANKMENTS HAVE NUMEROUS SMALL DIAMETER TREES AND BRUSH.	REMOVE TREES AND BRUSH; PROVIDE ADEQUATE FILTER COVERAGE ON THE DOWNSTREAM FACE OF THE EMBANKMENT.
JUNCTION OF EMBANKMENT AND ABUTMENT, SPILLWAY AND DAM	NO SPILLWAY - 6 FOOT WIDE BY 7 TO 10 FT HIGH ARCHED CULVERT CONCRETE APPROACH WALLS, CONCRETE WALLS VERY CRACKED AND SPALLED.	REPAIR DETERIORATED CULVERT STRUCTURE.
ANY NOTICEABLE SEEPAGE	WATER FLOWING FROM BASE OF DOWNSTREAM VERTICAL STONE WALL.	YOUNG BOY WHO LIVES IN AREA SAID THIS HAD BEEN FLOWING SINCE HE COULD REMEMBER.
STAFF GAGE AND RECORDER	NONE OBSERVED	
DRAINS	NONE OBSERVED	

UNCATED SPILLWAY - NO SPILLWAY

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONCRETE WEIR	NO SPILLWAY ASSOCIATED WITH RAILROAD EMBANKMENT.	
APPROACH CHANNEL		
DISCHARGE CHANNEL		
BRIDGE AND PIERS		

OUTLET WORKS

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CRACKING AND SPALLING OF CONCRETE SURFACES IN OUTLET CONDUIT	FACES OF ARCHED CULVERT UNDER EMBANKMENT VERY CRACKED AND SPALLED. DATE ON ARCHED CULVERT 1902. FOOTINGS OF TUNNEL BEING UNDERMINED BY STREAM FLOW. DEBRIS IN CULVERT.	REPAIR DETERIORATED STRUCTURE. REPAIR UNDERMINED FOOTINGS. REMOVE DEBRIS.
INTAKE STRUCTURE	NONE.	
OUTLET STRUCTURE	NONE.	
OUTLET CHANNEL	NATURAL BOULDER STREAMBED.	
EMERGENCY GATE	NONE.	

INSTRUMENTATION

VISUAL EXAMINATION MONUMENTATION/SURVEYS	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
	NEW JERSEY GEODETIC SURVEY CONTROL STATION NO 123 ON SOUTHERLY UPSTREAM CONCRETE WALL OF CULVERT.	CHECKED WITH NJ GEODETIC SURVEY: THEY SAY THIS DISC HAS NOT BEEN INSTALLED BY THEM. OWNERS AND ELEVATION OF SURVEY MONUMENT ARE UNKNOWN.
OBSERVATION WELLS	NONE OBSERVED.	
WEIRS	NONE OBSERVED.	
PIEZOMETERS	NONE OBSERVED.	
OTHER	NONE.	

RESERVOIR

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SLOPES	<p>SOUTH SHORELINE STEEP NATURAL MOUNTAINOUS SLOPES, APPROX 1H:1V TO 2H:1V.</p> <p>NORTH SHORELINE FLATTER WOODED SLOPES APPROX 10H:1V.</p>	
SEDIMENTATION	<p>ROCKY BOTTOM OF POND VISIBLE.</p> <p>OCCASIONAL DEAD BRANCHES.</p> <p>VERY LITTLE TO NO SILT OBSERVED ALONG SOUTH END OF POND.</p>	

DOWNSTREAM CHANNEL

<u>VISUAL EXAMINATION OF</u>	<u>OBSERVATIONS</u>	<u>REMARKS OR RECOMMENDATIONS</u>
CONDITION (OBSTRUCTIONS, DEBRIS, ETC.)	VERY LITTLE DEBRIS. OCCASIONAL PIECES OF WOOD AND BROKEN BOTTLES. MAINLY NATURAL BOULDER STREAMBED. PIECES OF PLYWOOD IN CULVERT.	
SLOPES	STEEP TO BOTTOM OF RAILROAD EMBANKMENT, THEN FLAT SLOPE IN STREAM CHANNEL.	
APPROXIMATE NO. OF HOMES AND POPULATION	NONE IMMEDIATELY VISIBLE FROM RAILROAD EMBANKMENT. NUMEROUS HOMES, STRUCTURES AND RECREATIONAL FACILITIES FURTHER SOUTH ALONG STREAM CHANNEL, BETWEEN APPROX 1500 TO 5000 FT DOWNSTREAM.	ACTIVE COMMUTER TRAINS TRAVEL ON EMBANKMENT.

APPENDIX 2

PHOTOGRAPHS



Upstream face of railroad
embankment bordering pond.

10 September 1980



Railroad embankment and Powder
Mill Road crossing south end
of pond.

10 September 1980



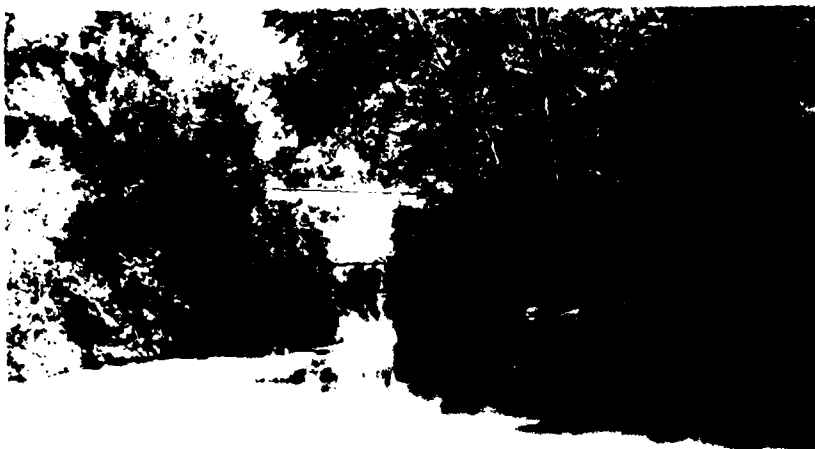
Crest of railroad embankment
looking north from Powder Mill
Road crossing.

10 September 1980



Crest of railroad embankment
looking south from Powder Mill
Road crossing.

10 September 1980



South end of pond leading to
approach channel of culvert.
Note prominent horizontal crack
in railroad embankment retaining
wall.

10 September 1980



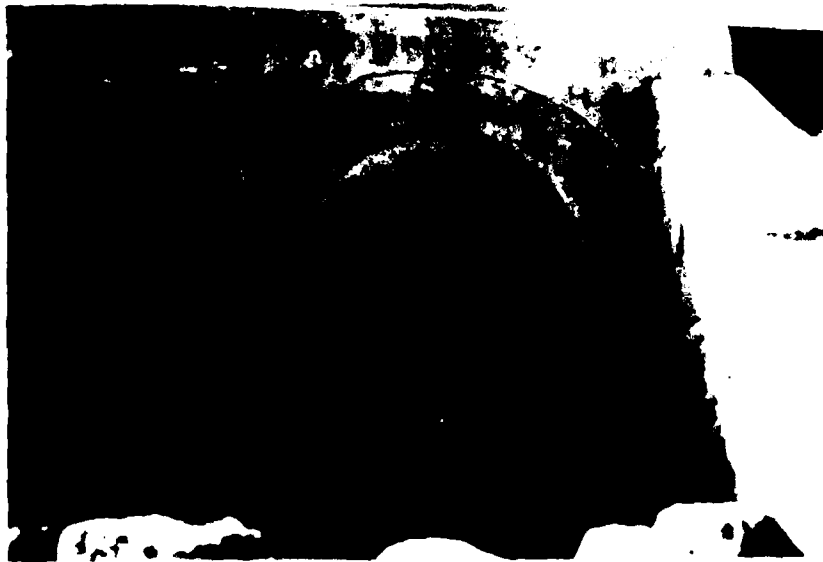
Approach channel just
before entering culvert.
Note erosion around wingwall
and cracks in wingwall.

10 September 1980



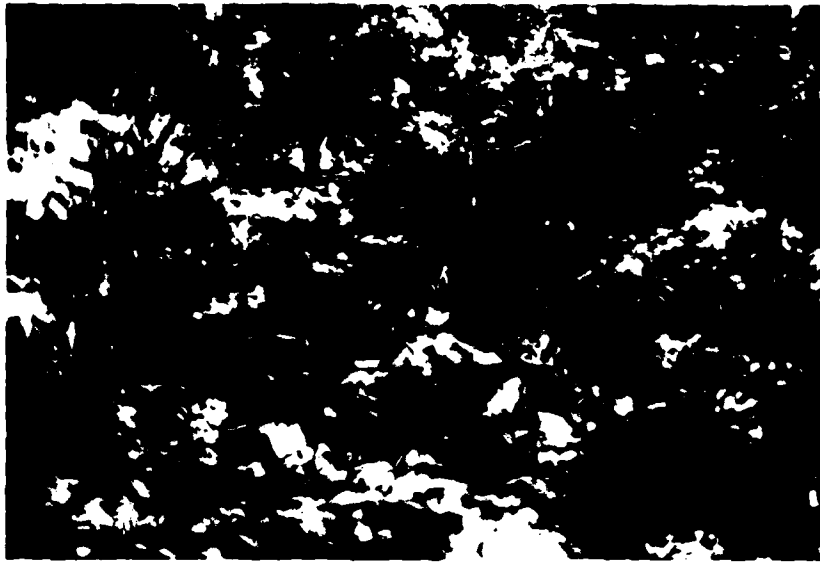
Upstream entrance of
culvert through railroad
embankment.
Note severe cracking of
concrete and debris in
culvert.

10 September 1980



Downstream face of culvert
through railroad embankment.
Note severe cracking of concrete.

10 September 1980



Discharge channel immediately
downstream of culvert.

10 September 1980



Pond looking upstream.

10 September 1980

APPENDIX 3

HYDROLOGIC COMPUTATIONS

HYDROLOGICAL COMPUTATIONS

POWDER MILL POND DAM

A. Location: Morris County, N.J. Whippany River

B. Drainage Area: 1.66 sq. mi (1065 acres)

C. Lake Area: 8.03 acres

D. Classification: Size - SMALL
Hazard - High

E. Spillway Design Flood: PMF

F. PMP

1. Dam located in Zone 6 (close to boundary of Zone 1)

PMP = 22.2 inches (for 200 sq. mi, 24 hr,
'all season envelope')*

2. PMF must be adjusted by a factor of 0.80**
to account for basin size under 10 sq. mi

% Factor (for 10 sq. mi)			
Duration	Zone 1	Zone 6	Avg
0-6	111	113	112
0-12	123	123	123
0-24	133	132	132
0-48	142	142	142

* HMR #33

** Page 48 "Design of Small Dams"

BY VAK

DATE

Powder Mill Pond Dam

JOB NO.

80115

CKD by

DATE

4/3/61

SHEET NO.

1 OF

G. UNIT HYDROGRAPH

Corps of Engineers has indicated that the SCS triangular unit hydrograph with curvilinear transformation be used for analysis

Drainage area = 1065 ac (a)

average slope = 3.25% (Y)

1) hydraulic length (L)

from drainage map

$$L = 12000 \text{ ft}$$

Soil group B, * wood or forest land CN = 66 to 55^{**}
use 60

$$S = \frac{1000}{CN} - 10 = \frac{1000}{60} - 10 = 6.67$$

Lag time (L)

$$L = \frac{L^{0.8} (S+1)^{0.7}}{1900 (Y)^{0.5}}$$

$$L = \frac{12000^{0.8} (6.67+1)^{0.7}}{1900 (3.25)^{0.5}}$$

$$L = 2.23 \text{ HRS}$$

$$T_L = \frac{L}{0.6} = 3.72 \text{ HRS}$$

* County Soil Survey - Sussex NJ (SCS)

** Table 2-2, SCS TR-55

BY <u>RWG</u>	DATE <u>11/18/80</u>	<u>LAG Time Calculations</u>	JOB NO. <u>80145</u>
CKD <u>pm</u>	DATE <u>7/21/11</u>	<u>POWDER MILL POND</u>	SHEET NO. <u>2</u> OF <u> </u>

2) From Nomograph (Small Dams pg 71)

$$T_c \text{ for } \left\{ \begin{array}{l} L = 12,000 \\ H = 900 - 510 \\ \quad = 390 \end{array} \right\} T_c = 0.62$$

$$\text{Lag} = .6 T_c = 0.37 \text{ Hr}$$

③ Estimate T_c from velocity and watercourse length

$$\text{length} = 12000 \text{ ft}$$

$$\text{avg slope} = 3.25\%$$

$$\therefore \text{avg velocity}^* = 2 \text{ ft/sec}$$

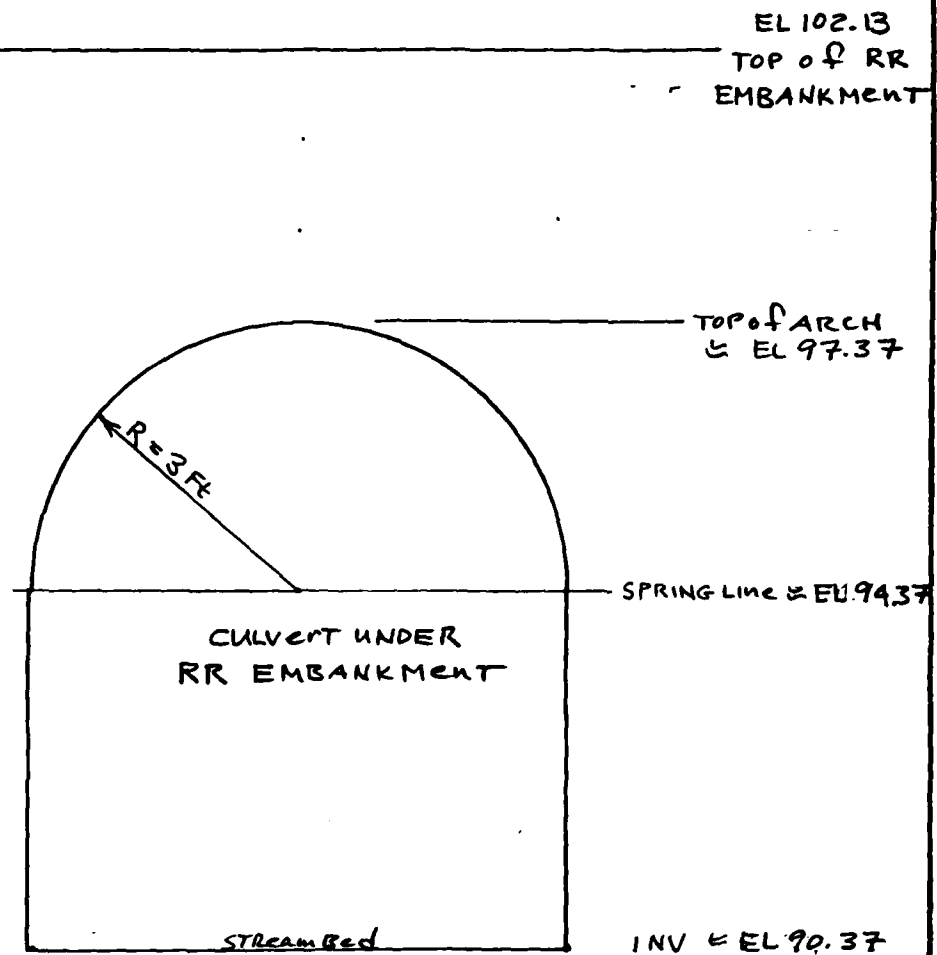
$$t_c = \frac{12000 \text{ ft}}{2 \text{ ft/sec}} = 6000 \text{ sec} = 1.67 \text{ HR}$$

$$\text{Lag} = .6 (T_c) = 0.6 (1.67) = 1.0 \text{ HR}$$

$$\text{Use } L = \frac{2.24 + 1.0}{2} = 1.6 \text{ HR}$$

* from Small Dams pg 70

BY <u>RWG</u>	DATE <u>11/18/80</u>	<u>LAG TIME CALCULATIONS</u>	JOB NO. <u>80195</u>
CKD. <u>fy</u>	DATE <u>2/23/81</u>	<u>POWDER MILL POND</u>	SHEET NO. <u>3</u> OF <u> </u>



$$\text{AREA} = (4 \text{ ft} \times 6 \text{ ft}) + \frac{\pi (3)^2}{2} = 38.14 \text{ ft}^2$$

∴ ASSUME RECTANGULAR CULVERT 5.45 ft wide x 7 ft HIGH

POOL ELEVATION	L = 5.45			L = 660 ft			
	CULVERT DISCHARGE WEIR AND ORIFICE			WEIR DISCHARGE OVER RR EMBANKMENT			
	H, ft	C	Q, cfs	H, ft	C	Q, cfs	ΣQ cfs
90.37	0	—					0
92.37	2	2.63	141				41
94.37	4	2.63	1115				115
96.37	6	2.63	211				211
97.37	7	2.63	266				266
ORIFICE 99.37	5.5	0.6	430				430
101.37	7.5	0.6	502				502
102.13	8.26	0.6	528	0			528
103.0	9.13	0.6	555	0.87	2.64	1414	1969
104.0	10.13	0.6	584	1.87	2.63	4439	5023

WEIR FLOW $Q = CLH^{3/2}$, C FROM HANDBOOK OF HYDRAULICS, PG 5-46, TABLE 5-3.

ORIFICE FLOW $Q = Ca\sqrt{2gh}$, FROM HANDBOOK OF HYDRAULICS, EQ 4-10, C FROM

C FROM TABLE 4-8, MODEL E, C = 0.6

BY RWG

DATE 11/19/80

OUT FLOW CALCULATIONS

JOB NO. 80145

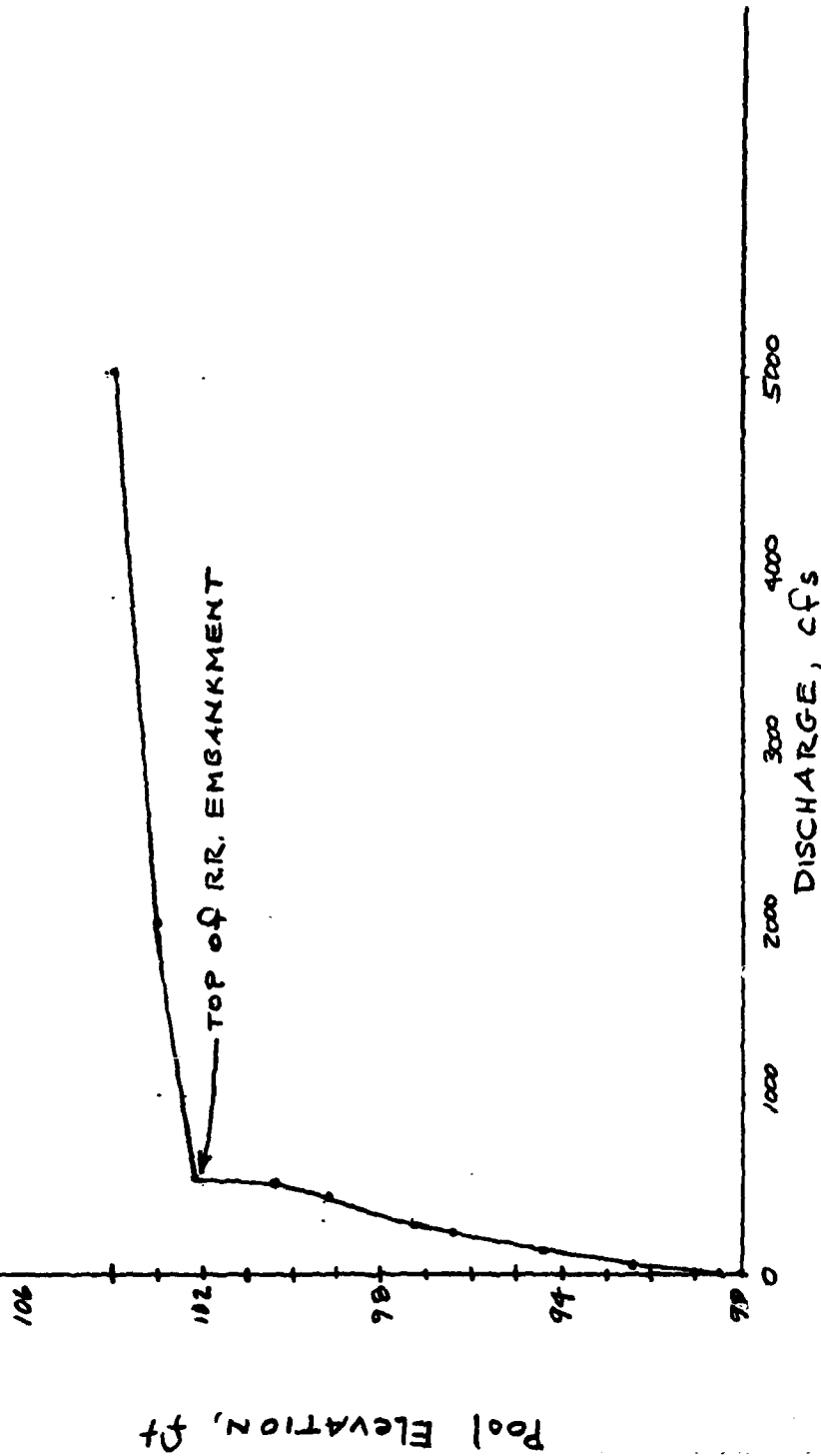
CKD fy

DATE 2/2/81

POWDER MILL POND

SHEET NO. 5 OF 5

LANGAN ENGINEERING ASSOCIATES, INC.



DISCHARGE RATING CURVE FOR R.R. EMBANKMENT
ADJACENT TO POWDER MILL POND

BY RWG DATE 11/19/80 DISCHARGE CURVE

JOB NO. 80145

CKD Ry DATE 7/23/81 POWDER MILL POND

SHEET NO. 6 OF

Reservoir Storage Capacity

Powder Mill Pond is approximately rectangular in shape, measuring about 1000 ft in length by 350 ft average width with the water elevation at normal pool (arbitrary el 92)

Surface area with water level @ el 92
 $= 1000 \text{ ft} \times 350 \text{ ft} = 8.03 \text{ Ac.}$

Take average side slope in close proximity of the pond
 $= 1V : 10H.$

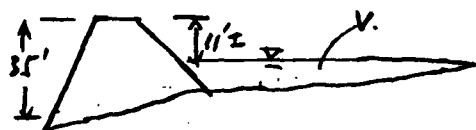
∴ for every foot of water above or below el 92, the length and width of the pond increase or decrease by
 $= 1 \times 10 \times 2 = 20 \text{ ft.}$

Elev. (ft)	Length (ft)	Width (ft)	Area of Pond (Acres)
90	1060	310	7.54
92	1000	350	8.03
102.13	1202.6	552.6	15.26
104.0	1240	590	16.80

← Top of Embankment

Storage capacity vs elevation to be calculated by HEC-1

Estimate storage at normal pool (el 92)



$$V = 8.03 \times \frac{35 - 11}{2}$$

$$= 96 \text{ Ac-ft.}$$

BY PK DATE 2/21/81 POWDER MILL POND JOB NO. 80145
 CKD RWG DATE 3/3/81 SHEET NO. 7 OF

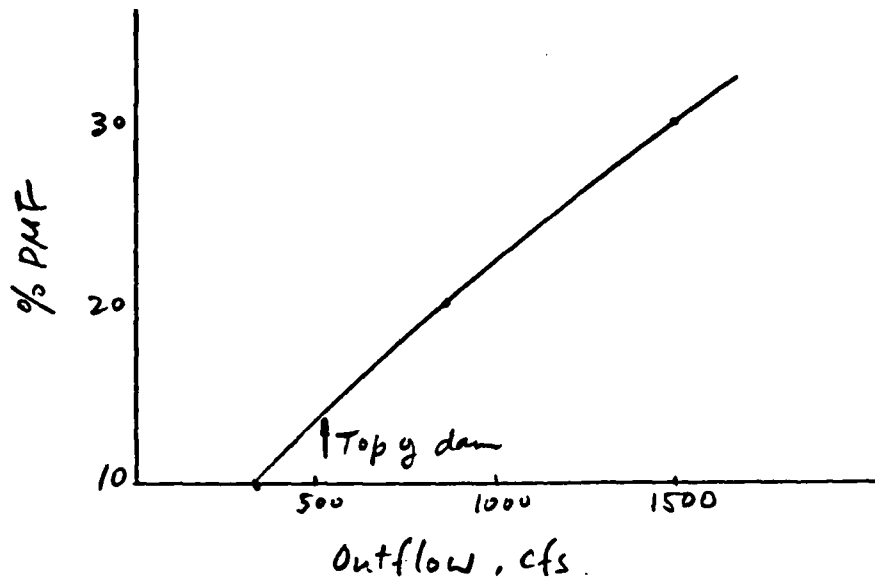
SUMMARY OF HYDROGRAPH AND FLOOD Routing

- 1) HYDROGRAPH & Routing calculated
USING HEC-1
- 2) PMF Peak inflow for Powder Mill Pond
is 5005 cfs routed to 4991 cfs.
- 3) Routing of the PMF indicates the
Railroad Embankment will OVERTOP BY 1.86 Ft.
- 4) Routing of the $\frac{1}{2}$ PMF indicates the
RAILROAD Embankment will OVERTOP BY 1.04 Ft.

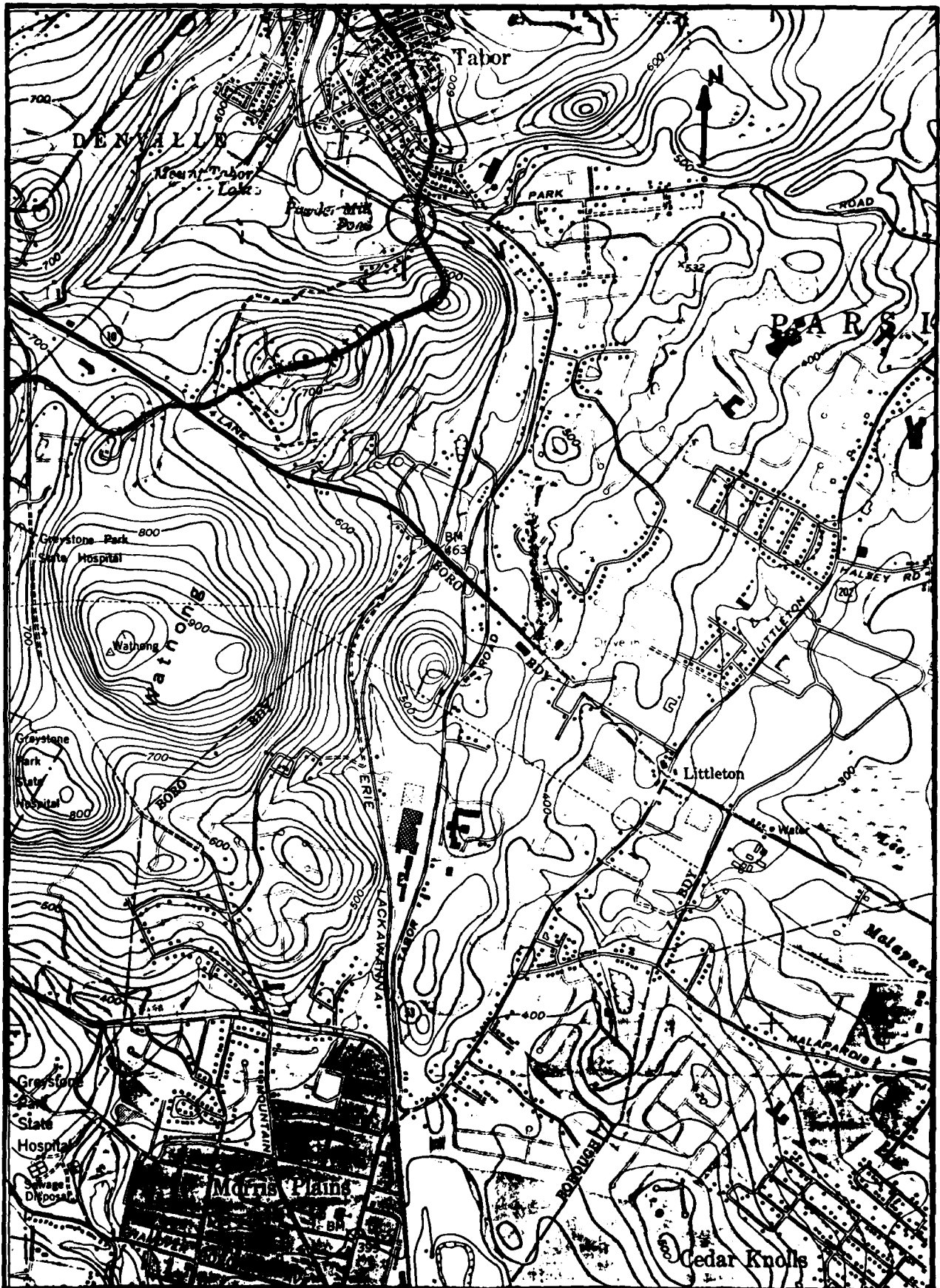
BY <u>RWG</u>	DATE <u>11/20/80</u>	<u>HEC-1 SUMMARY</u>	JOB NO. <u>80145</u>
CKD <u>py</u>	DATE <u>2/23/81</u>	<u>POWDER MILL POND</u>	SHEET NO. <u>8</u> OF <u> </u>

OVERTOPPING POTENTIAL

- 1) Various % of PMF have been routed using HEC-1
- 2) Plot peak outflow vs % PMF



- 3) Dam overtops at elevation 102.13 with $Q = 528 \text{ cfs}$.
 \therefore dam can pass approximately 14% of the PMF.



DRAINAGE BASIN

POWDER MILL POND

MAP SOURCE USES

MORRISTOWN SCALE: 1" = 200'

PROJ NO E045

SHEET _____ OF _____

LANGAN ENGINEERING ASSOCIATES, INC.

HEC-1 OUTPUT
POWDER MILL POND

[illegible][illegible]

PREVIEW OF SEQUENCE OF STREAM NETWORK CALCULATIONS	1	2
RUNOFF HYDROGRAPH AT		
ROUTE HYDROGRAPH TO		
END OF NETWORK		

A/SEA 9Z MOLLVD14100N 1807
D61 YJN NOIRMA ATADAR DAN
FLUP HYBARDKAM PACKAGE (MCC-1)

RUN DATE 01/03/03.
TIME 12.47.34.

POWDER MILL POND (00803)
INFLOW HYDROGRAPHY AND ROUTING
N.J. DAM INSPECTION

JOB SPECIFICATION									
NO	NHR	MMIN	IDAY	IHR	IMIN	METRC	IPLT	IPRT	NSTAN
290	0	10	0	0	0	0	0	0	0
			JOPER	NWT	LROPT	TRACE			
			3	0	0	0			

SUB-AREA RUNOFF COMPUTATION

COMPUTE HYDROGRAPH

ISTAG	ICUMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
1	0	0	0	0	0	1	0	0

HYDROGRAPH DATA									
IHYDG	1UNB	TAKEA	SNAP	TRSDA	TRSPC	RATIO	ISNDW	ISAME	LOCAL
1	2	1.66	0.00	1.66	.80	0.000	0	0	0

PRECIP DATA							
SPFE	PMS	R6	R12	R24	R48	R72	R96
0.00	22.20	112.00	123.00	132.00	142.00	0.00	0.00

LOSS DATA										
LROPT	STARR	DLTKR	RTIOL	ERAIN	STKRS	WTIOK	STRTL	CNSTL	ALSHX	RTIHP
0	0.00	0.00	1.00	0.00	0.00	1.00	1.00	.15	0.00	0.00

UNIT HYDROGRAPH DATA
TC= 0.00 LAG= 1.60

RECESSION DATA
STATQ= -2.00 GRCSN= 0.00 RTIUR= 1.00

UNIT HYDROGRAPH 50 END OF PERIOD ORIGINATES, TC= 0.00 HOURS, LAG= 1.60									
14.	47.	89.	145.	220.	309.	385.	439.	469.	476.
472.	446.	414.	377.	331.	276.	227.	192.	163.	138.
120.	102.	88.	73.	63.	53.	46.	39.	33.	28.
24.	20.	17.	15.	13.	11.	9.	8.	7.	6.
5.	4.	4.	3.	3.	2.	2.	1.	1.	0.

END-OF-PERIOD FLOW													
NO.DA	MR.MN	PERIOD	RAIN	EXCS	LOSS	COMP Q	NO.DA	MR.MN	PERIOD	RAIN	EXCS	LOSS	COMP Q
1.01	.10	1	.00	0.00	.00	3.	1.02	.20	146	.02	0.00	.02	3.
1.01	.20	2	.00	0.00	.00	3.	1.02	.50	147	.02	0.00	.02	3.
1.01	.30	3	.00	0.00	.00	3.	1.02	.40	148	.02	0.00	.02	3.
1.01	.40	4	.00	0.00	.00	3.	1.02	.50	149	.02	0.00	.02	3.
1.01	.50	5	.00	0.00	.00	3.	1.02	1.00	150	.02	0.00	.02	3.
1.01	1.00	6	.00	0.00	.00	3.	1.02	1.10	151	.02	0.00	.02	3.
1.01	1.10	7	.00	0.00	.00	3.	1.02	1.20	152	.02	0.00	.02	3.
1.01	1.20	8	.00	0.00	.00	3.	1.02	1.30	153	.02	0.00	.02	3.
1.01	1.30	9	.00	0.00	.00	3.	1.02	1.40	154	.02	0.00	.02	3.
1.01	1.40	10	.00	0.00	.00	3.	1.02	1.50	155	.02	0.00	.02	3.
1.01	1.50	11	.00	0.00	.00	1.	1.02	2.00	164	.02	0.00	.02	1.

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1.01	2.00	12	.00	0.00	.00	1.02	2.10	157	.02	0.00	.02	3.
1.01	2.10	13	.00	0.00	.00	1.02	2.20	158	.02	0.00	.02	3.
1.01	2.20	14	.00	0.00	.00	1.02	2.30	159	.02	0.00	.02	3.
1.01	2.30	15	.00	0.00	.00	1.02	2.40	160	.02	0.00	.02	3.
1.01	2.40	16	.00	0.00	.00	1.02	2.50	161	.02	0.00	.02	3.
1.01	2.50	17	.00	0.00	.00	1.02	3.00	162	.02	0.00	.02	3.
1.01	3.00	18	.00	0.00	.00	1.02	3.10	163	.02	0.00	.02	3.
1.01	3.10	19	.00	0.00	.00	1.02	3.20	164	.02	0.00	.02	3.
1.01	3.20	20	.00	0.00	.00	1.02	3.30	165	.02	0.00	.02	3.
1.01	3.30	21	.00	0.00	.00	1.02	3.40	166	.02	0.00	.02	3.
1.01	3.40	22	.00	0.00	.00	1.02	3.50	167	.02	0.00	.02	3.
1.01	3.50	23	.00	0.00	.00	1.02	4.00	168	.02	0.00	.02	3.
1.01	4.00	24	.00	0.00	.00	1.02	4.10	169	.02	0.00	.02	3.
1.01	4.10	25	.00	0.00	.00	1.02	4.20	170	.02	0.00	.02	3.
1.01	4.20	26	.00	0.00	.00	1.02	4.30	171	.02	0.00	.02	3.
1.01	4.30	27	.00	0.00	.00	1.02	4.40	172	.02	0.00	.02	3.
1.01	4.40	28	.00	0.00	.00	1.02	4.50	173	.02	0.00	.02	3.
1.01	4.50	29	.00	0.00	.00	1.02	5.00	174	.02	0.00	.02	3.
1.01	5.00	30	.00	0.00	.00	1.02	5.10	175	.02	0.00	.02	3.
1.01	5.10	31	.00	0.00	.00	1.02	5.20	176	.02	0.00	.02	3.
1.01	5.20	32	.00	0.00	.00	1.02	5.30	177	.02	0.00	.02	3.
1.01	5.30	33	.00	0.00	.00	1.02	5.40	178	.02	0.00	.02	3.
1.01	5.40	34	.00	0.00	.00	1.02	5.50	179	.02	0.00	.02	3.
1.01	5.50	35	.00	0.00	.00	1.02	6.00	180	.02	0.00	.02	3.
1.01	6.00	36	.00	0.00	.00	1.02	6.10	181	.05	.03	.03	4.
1.01	6.10	37	.00	0.00	.00	1.02	6.20	182	.05	.03	.03	5.
1.01	6.20	38	.00	0.00	.00	1.02	6.30	183	.05	.03	.03	8.
1.01	6.30	39	.00	0.00	.00	1.02	6.40	184	.05	.03	.03	12.
1.01	6.40	40	.00	0.00	.00	1.02	6.50	185	.05	.03	.03	18.
1.01	6.50	41	.00	0.00	.00	1.02	7.00	186	.05	.03	.03	27.
1.01	7.00	42	.00	0.00	.00	1.02	7.10	187	.05	.03	.03	39.
1.01	7.10	43	.00	0.00	.00	1.02	7.20	188	.05	.03	.03	52.
1.01	7.20	44	.00	0.00	.00	1.02	7.30	189	.05	.03	.03	65.
1.01	7.30	45	.00	0.00	.00	1.02	7.40	190	.05	.03	.03	79.
1.01	7.40	46	.00	0.00	.00	1.02	7.50	191	.05	.03	.03	93.
1.01	7.50	47	.00	0.00	.00	1.02	8.00	192	.05	.03	.03	106.
1.01	8.00	48	.00	0.00	.00	1.02	8.10	193	.05	.03	.03	118.
1.01	8.10	49	.00	0.00	.00	1.02	8.20	194	.05	.03	.03	129.
1.01	8.20	50	.00	0.00	.00	1.02	8.30	195	.05	.03	.03	139.
1.01	8.30	51	.00	0.00	.00	1.02	8.40	196	.05	.03	.03	147.
1.01	8.40	52	.00	0.00	.00	1.02	8.50	197	.05	.03	.03	154.
1.01	8.50	53	.00	0.00	.00	1.02	9.00	198	.05	.03	.03	159.
1.01	9.00	54	.00	0.00	.00	1.02	9.10	199	.05	.03	.03	164.
1.01	9.10	55	.00	0.00	.00	1.02	9.20	200	.05	.03	.03	168.
1.01	9.20	56	.00	0.00	.00	1.02	9.30	201	.05	.03	.03	172.
1.01	9.30	57	.00	0.00	.00	1.02	9.40	202	.05	.03	.03	175.
1.01	9.40	58	.00	0.00	.00	1.02	9.50	203	.05	.03	.03	177.
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1.01	10.00	60	.00	0.00	.00	1.02	10.10	205	.05	.03	.03	181.
1.01	10.10	61	.00	0.00	.00	1.02	10.20	206	.05	.03	.03	183.
1.01	10.20	62	.00	0.00	.00	1.02	10.30	207	.05	.03	.03	184.
1.01	10.30	63	.00	0.00	.00	1.02	10.40	208	.05	.03	.03	185.
1.01	10.40	64	.00	0.00	.00	1.02	10.50	209	.05	.03	.03	186.
1.01	10.50	65	.00	0.00	.00	1.02	11.00	210	.05	.03	.03	187.
1.01	11.00	66	.00	0.00	.00	1.02	11.10	211	.05	.03	.03	188.
1.01	11.10	67	.00	0.00	.00	1.02	11.20	212	.05	.03	.03	188.
1.01	11.20	68	.00	0.00	.00	1.02	11.30	213	.05	.03	.03	189.
1.01	11.30	69	.00	0.00	.00	1.02	11.40	214	.05	.03	.03	189.
1.01	11.40	70	.00	0.00	.00	1.02	11.50	215	.05	.03	.03	189.
1.01	11.50	71	.00	0.00	.00	1.02	12.00	216	.05	.03	.03	190.
1.01	12.00	72	.00	0.00	.00	1.02	12.10	217	.33	.31	.03	194.
1.01	12.10	73	.03	0.00	.03	1.02	12.20	218	.33	.31	.03	207.
1.01	12.20	74	.03	0.00	.03	1.02	12.30	219	.33	.31	.03	232.
1.01	12.30	75	.03	0.00	.03	1.02	12.40	220	.33	.31	.03	273.
1.01	12.40	76	.03	0.00	.03	1.02	12.50	221	.33	.31	.03	334.
1.01	12.50	77	.03	0.00	.03	1.02	13.00	222	.33	.31	.03	419.

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1.01	13.00	78	.03	0.00	.03	3.	1.02	13.10	223	.40	.37	.03	527.
1.01	13.10	79	.03	0.00	.03	3.	1.02	13.20	224	.40	.37	.03	552.
1.01	13.20	80	.03	0.00	.03	3.	1.02	13.30	225	.40	.37	.03	788.
1.01	13.30	81	.03	0.00	.03	3.	1.02	13.40	226	.40	.37	.03	930.
1.01	13.40	82	.03	0.00	.03	3.	1.02	13.50	227	.40	.37	.03	1075.
1.01	13.50	83	.03	0.00	.03	3.	1.02	14.00	228	.40	.37	.03	1219.
1.01	14.00	84	.03	0.00	.03	3.	1.02	14.10	229	.50	.47	.03	1361.
1.01	14.10	85	.04	0.00	.04	3.	1.02	14.20	230	.50	.47	.03	1499.
1.01	14.20	86	.04	0.00	.04	3.	1.02	14.30	231	.50	.47	.03	1631.
1.01	14.30	87	.04	0.00	.04	3.	1.02	14.40	232	.50	.47	.03	1753.
1.01	14.40	88	.04	0.00	.04	3.	1.02	14.50	233	.50	.47	.03	1870.
1.01	14.50	89	.04	0.00	.04	3.	1.02	15.00	234	.50	.47	.03	1983.
1.01	15.00	90	.04	0.00	.04	3.	1.02	15.10	235	.45	.43	.03	2093.
1.01	15.10	91	.03	0.00	.03	3.	1.02	15.20	236	.76	.73	.03	2202.
1.01	15.20	92	.06	0.00	.06	3.	1.02	15.30	237	1.36	1.34	.03	2323.
1.01	15.30	93	.10	0.00	.10	3.	1.02	15.40	238	3.40	3.38	.03	2495.
1.01	15.40	94	.26	.19	.07	6.	1.02	15.50	239	.98	.96	.03	2731.
1.01	15.50	95	.07	.05	.03	13.	1.02	16.00	240	.40	.58	.03	3012.
1.01	16.00	96	.05	.02	.03	23.	1.02	16.10	241	.46	.44	.03	3352.
1.01	16.10	97	.04	.01	.03	36.	1.02	16.20	242	.46	.44	.03	3755.
1.01	16.20	98	.04	.01	.03	54.	1.02	16.30	243	.46	.44	.03	4184.
1.01	16.30	99	.04	.01	.03	76.	1.02	16.40	244	.46	.44	.03	4531.
1.01	16.40	100	.04	.01	.03	98.	1.02	16.50	245	.46	.44	.03	4811.
1.01	16.50	101	.04	.01	.03	116.	1.02	17.00	246	.46	.44	.03	4960.
1.01	17.00	102	.04	.01	.03	129.	1.02	17.10	247	.36	.34	.03	5005.
1.01	17.10	103	.03	.00	.03	136.	1.02	17.20	248	.36	.34	.03	4975.
1.01	17.20	104	.03	.00	.03	141.	1.02	17.30	249	.36	.34	.03	4859.
1.01	17.30	105	.03	.00	.03	140.	1.02	17.40	250	.36	.34	.03	4697.
1.01	17.40	106	.03	.00	.03	136.	1.02	17.50	251	.36	.34	.03	4496.
1.01	17.50	107	.03	.00	.03	131.	1.02	18.00	252	.36	.34	.03	4249.
1.01	18.00	108	.03	.00	.03	122.	1.02	18.10	253	.03	.00	.03	3966.
1.01	18.10	109	.00	.00	.00	110.	1.02	18.20	254	.03	.00	.03	3693.
1.01	18.20	110	.00	.00	.00	97.	1.02	18.30	255	.03	.00	.03	3450.
1.01	18.30	111	.00	.00	.00	87.	1.02	18.40	256	.03	.00	.03	3219.
1.01	18.40	112	.00	.00	.00	77.	1.02	18.50	257	.03	.00	.03	2986.
1.01	18.50	113	.00	.00	.00	69.	1.02	19.00	258	.03	.00	.03	2749.
1.01	19.00	114	.00	.00	.00	61.	1.02	19.10	259	.03	.00	.03	2499.
1.01	19.10	115	.00	.00	.00	54.	1.02	19.20	260	.03	.00	.03	2244.
1.01	19.20	116	.00	.00	.00	48.	1.02	19.30	261	.03	.00	.03	1990.
1.01	19.30	117	.00	.00	.00	41.	1.02	19.40	262	.03	.00	.03	1752.
1.01	19.40	118	.00	.00	.00	36.	1.02	19.50	263	.03	.00	.03	1527.
1.01	19.50	119	.00	.00	.00	31.	1.02	20.00	264	.03	.00	.03	1321.
1.01	20.00	120	.00	.00	.00	27.	1.02	20.10	265	.03	.00	.03	1133.
1.01	20.10	121	.00	.00	.00	24.	1.02	20.20	266	.03	.00	.03	965.
1.01	20.20	122	.00	.00	.00	21.	1.02	20.30	267	.03	.00	.03	817.
1.01	20.30	123	.00	.00	.00	18.	1.02	20.40	268	.03	.00	.03	695.
1.01	20.40	124	.00	.00	.00	16.	1.02	20.50	269	.03	.00	.03	593.
1.01	20.50	125	.00	.00	.00	14.	1.02	21.00	270	.03	.00	.03	507.
1.01	21.00	126	.00	.00	.00	12.	1.02	21.10	271	.03	.00	.03	434.
1.01	21.10	127	.00	.00	.00	11.	1.02	21.20	272	.03	.00	.03	372.
1.01	21.20	128	.00	.00	.00	10.	1.02	21.30	273	.03	.00	.03	319.
1.01	21.30	129	.00	.00	.00	9.	1.02	21.40	274	.03	.00	.03	273.
1.01	21.40	130	.00	.00	.00	8.	1.02	21.50	275	.03	.00	.03	233.
1.01	21.50	131	.00	.00	.00	7.	1.02	22.00	276	.03	.00	.03	200.
1.01	22.00	132	.00	.00	.00	7.	1.02	22.10	277	.03	.00	.03	172.
1.01	22.10	133	.00	.00	.00	6.	1.02	22.20	278	.03	.00	.03	149.
1.01	22.20	134	.00	.00	.00	6.	1.02	22.30	279	.03	.00	.03	129.
1.01	22.30	135	.00	.00	.00	6.	1.02	22.40	280	.03	.00	.03	111.
1.01	22.40	136	.00	.00	.00	5.	1.02	22.50	281	.03	.00	.03	96.
1.01	22.50	137	.00	.00	.00	5.	1.02	23.00	282	.03	.00	.03	83.
1.01	23.00	138	.00	.00	.00	5.	1.02	23.10	283	.03	.00	.03	72.
1.01	23.10	139	.00	.00	.00	4.	1.02	23.20	284	.03	.00	.03	62.
1.01	23.20	140	.00	.00	.00	4.	1.02	23.30	285	.03	.00	.03	53.
1.01	23.30	141	.00	.00	.00	4.	1.02	23.40	286	.03	.00	.03	45.
1.01	23.40	142	.00	.00	.00	4.	1.02	23.50	287	.03	.00	.03	39.
1.01	23.50	143	.00	.00	.00	4.	1.03	0.00	288	.03	.00	.03	14.

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1.02 0.00 144 .00 0.00 .00 4. 1.03 .10 289 0.00 0.00 0.00 30.
1.02 .10 145 .02 0.00 .02 4. 1.03 .20 290 0.00 0.00 0.00 27.
SUM 25.22 20.44 4.78 132061.
(641.)(519.)(121.)(3739.55)

PEAK 4-HOUR 24-HOUR 72-HOUR TOTAL VOLUME
5003. 3061. 899. 455. 132091.
142. 87. 25. 13. 3740.
CFS 17.15 20.56 20.56
CMS 435.68 511.89 522.26
INCHES 1518. 1783. 1819.
MM 1872. 2244. 2244.
AC-FT
THOUS CU M

HYDROGRAPH ROUTING

ROUTING COMPUTATIONS

STAGE	90.37	92.37	94.37	96.37	97.37	99.37	101.37	102.13	103.00	104.00
FLOW	0.00	41.00	115.00	211.00	266.00	430.00	502.00	528.00	1969.00	5023.00
SURFACE AREA	8.	8.	15.	17.						
CAPACITY	0.	16.	132.	162.						
ELEVATION	90.	92.	102.	104.						
CREL	90.4	90.4	90.4	90.4	90.4	90.4	90.4	90.4	90.4	90.4
SPHID	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
COBW	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
EXPW	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ELEV	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
COOL	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CAREA	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
EXPL	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
IECON	0	1	0	0	0	0	0	0	0	0
ITAPE	0	0	0	0	0	0	0	0	0	0
JPLT	0	0	0	0	0	0	0	0	0	0
IPMP	0	0	0	0	0	0	0	0	0	0
IPMT	0	0	0	0	0	0	0	0	0	0
ISAME	0	0	0	0	0	0	0	0	0	0
LAG	0	0	0	0	0	0	0	0	0	0
ANSKK	0	0	0	0	0	0	0	0	0	0
X	0	0	0	0	0	0	0	0	0	0
STORA	0	0	0	0	0	0	0	0	0	0
ISPRAT	0	0	0	0	0	0	0	0	0	0
IPRT	0	0	0	0	0	0	0	0	0	0
INAME	0	0	0	0	0	0	0	0	0	0
ISTAGE	0	0	0	0	0	0	0	0	0	0
IAUTD	0	0	0	0	0	0	0	0	0	0

NO. DA	MR. MN	END-OF-PERIOD HYDROGRAPH ORIGINATES				DAM DATA				STAGE			
		PERIOD	HOURS	INFLW	OUTFLW	STORAGE	STAGE	INFLW	OUTFLW	STORAGE	STAGE		
1.01	.10	1	.17	3.	0.	0.	0.	90.0	90.0	90.0	90.0		
1.01	.20	2	.33	3.	0.	0.	0.	90.0	90.0	90.0	90.0		
1.01	.30	3	.50	3.	0.	0.	0.	90.0	90.0	90.0	90.0		
1.01	.40	4	.67	3.	0.	0.	0.	90.0	90.0	90.0	90.0		
1.01	.50	5	.83	3.	0.	0.	0.	90.0	90.0	90.0	90.0		
1.01	1.00	6	1.00	3.	0.	0.	0.	90.0	90.0	90.0	90.0		
1.01	1.10	7	1.17	3.	0.	0.	0.	90.0	90.0	90.0	90.0		
1.01	1.20	8	1.33	3.	0.	0.	0.	90.0	90.0	90.0	90.0		
1.01	1.30	9	1.50	3.	0.	0.	0.	90.0	90.0	90.0	90.0		
1.01	1.40	10	1.67	3.	0.	0.	0.	90.0	90.0	90.0	90.0		
1.01	1.50	11	1.83	3.	0.	0.	0.	90.0	90.0	90.0	90.0		
1.01	2.00	12	2.00	3.	0.	0.	0.	90.0	90.0	90.0	90.0		

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1.01	2.20	14	2.33	3.	0.	1.	90.1
1.01	2.30	15	2.50	3.	0.	1.	90.1
1.01	2.40	16	2.67	3.	0.	1.	90.1
1.01	2.50	17	2.83	3.	0.	1.	90.1
1.01	3.00	18	3.00	3.	0.	1.	90.1
1.01	3.10	19	3.17	3.	0.	1.	90.1
1.01	3.20	20	3.33	3.	0.	1.	90.1
1.01	3.30	21	3.50	3.	0.	1.	90.1
1.01	3.40	22	3.67	3.	0.	1.	90.1
1.01	3.50	23	3.83	3.	0.	1.	90.1
1.01	4.00	24	4.00	3.	0.	1.	90.1
1.01	4.10	25	4.17	3.	0.	1.	90.2
1.01	4.20	26	4.33	3.	0.	1.	90.2
1.01	4.30	27	4.50	3.	0.	1.	90.2
1.01	4.40	28	4.67	3.	0.	1.	90.2
1.01	4.50	29	4.83	3.	0.	1.	90.2
1.01	5.00	30	5.00	3.	0.	1.	90.2
1.01	5.10	31	5.17	3.	0.	1.	90.2
1.01	5.20	32	5.33	3.	0.	1.	90.2
1.01	5.30	33	5.50	3.	0.	2.	90.2
1.01	5.40	34	5.67	3.	0.	2.	90.2
1.01	5.50	35	5.83	3.	0.	2.	90.2
1.01	6.00	36	6.00	3.	0.	2.	90.2
1.01	6.10	37	6.17	3.	0.	2.	90.2
1.01	6.20	38	6.33	3.	0.	2.	90.2
1.01	6.30	39	6.50	3.	0.	2.	90.2
1.01	6.40	40	6.67	3.	0.	2.	90.2
1.01	6.50	41	6.83	3.	0.	2.	90.2
1.01	7.00	42	7.00	3.	0.	2.	90.3
1.01	7.10	43	7.17	3.	0.	2.	90.3
1.01	7.20	44	7.33	3.	0.	2.	90.3
1.01	7.30	45	7.50	3.	0.	2.	90.3
1.01	7.40	46	7.67	3.	0.	2.	90.3
1.01	7.50	47	7.83	3.	0.	2.	90.3
1.01	8.00	48	8.00	3.	0.	2.	90.3
1.01	8.10	49	8.17	3.	0.	2.	90.3
1.01	8.20	50	8.33	3.	0.	2.	90.3
1.01	8.30	51	8.50	3.	0.	2.	90.3
1.01	8.40	52	8.67	3.	0.	2.	90.3
1.01	8.50	53	8.83	3.	0.	2.	90.3
1.01	9.00	54	9.00	3.	0.	2.	90.3
1.01	9.10	55	9.17	3.	0.	2.	90.3
1.01	9.20	56	9.33	3.	0.	2.	90.3
1.01	9.30	57	9.50	3.	0.	2.	90.3
1.01	9.40	58	9.67	3.	0.	2.	90.3
1.01	9.50	59	9.83	3.	0.	2.	90.3
1.01	10.00	60	10.00	3.	0.	2.	90.4
1.01	10.10	61	10.17	3.	0.	2.	90.4
1.01	10.20	62	10.33	3.	0.	2.	90.4
1.01	10.30	63	10.50	3.	0.	2.	90.4
1.01	10.40	64	10.67	3.	0.	2.	90.4
1.01	10.50	65	10.83	3.	0.	2.	90.4
1.01	11.00	66	11.00	3.	1.	2.	90.4
1.01	11.10	67	11.17	3.	1.	2.	90.4
1.01	11.20	68	11.33	3.	1.	2.	90.4
1.01	11.30	69	11.50	3.	1.	2.	90.4
1.01	11.40	70	11.67	3.	1.	2.	90.4
1.01	11.50	71	11.83	3.	1.	2.	90.4
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1.01	12.30	75	12.50	3.	1.	2.	90.4
1.01	12.40	76	12.67	3.	1.	2.	90.4
1.01	12.50	77	12.83	3.	1.	2.	90.4
1.01	13.00	78	13.00	3.	2.	2.	90.4
1.01	13.10	79	13.17	3.	2.	2.	90.4

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1.01	13.20	80	13.33	3.	2.	3.	90.5
1.01	13.30	81	13.50	3.	2.	3.	90.5
1.01	13.40	82	13.67	3.	2.	3.	90.5
1.01	13.50	83	13.83	3.	2.	3.	90.5
1.01	14.00	84	14.00	3.	2.	4.	90.5
1.01	14.10	85	14.17	3.	2.	4.	90.5
1.01	14.20	86	14.33	3.	2.	4.	90.5
1.01	14.30	87	14.50	3.	2.	4.	90.5
1.01	14.40	88	14.67	3.	2.	4.	90.5
1.01	14.50	89	14.83	3.	2.	4.	90.5
1.01	15.00	90	15.00	3.	2.	4.	90.5
1.01	15.10	91	15.17	3.	2.	4.	90.5
1.01	15.20	92	15.33	3.	2.	4.	90.5
1.01	15.30	93	15.50	3.	2.	4.	90.5
1.01	15.40	94	15.67	6.	2.	4.	90.5
1.01	15.50	95	15.83	13.	3.	4.	90.5
1.01	16.00	96	16.00	23.	3.	4.	90.5
1.01	16.10	97	16.17	36.	4.	4.	90.6
1.01	16.20	98	16.33	54.	16.	5.	90.6
1.01	16.30	99	16.50	76.	8.	6.	90.7
1.01	16.40	100	16.67	98.	11.	7.	90.9
1.01	16.50	101	16.83	116.	14.	8.	91.1
1.01	17.00	102	17.00	129.	18.	10.	91.2
1.01	17.10	103	17.17	136.	22.	11.	91.4
1.01	17.20	104	17.33	141.	26.	13.	91.6
1.01	17.30	105	17.50	140.	30.	14.	91.8
1.01	17.40	106	17.67	136.	34.	16.	92.0
1.01	17.50	107	17.83	131.	37.	17.	92.2
1.01	18.00	108	18.00	122.	40.	18.	92.3
1.01	18.10	109	18.17	110.	44.	19.	92.5
1.01	18.20	110	18.33	97.	48.	20.	92.5
1.01	18.30	111	18.50	87.	50.	21.	92.6
1.01	18.40	112	18.67	77.	52.	21.	92.7
1.01	18.50	113	18.83	69.	53.	21.	92.7
1.01	19.00	114	19.00	61.	54.	22.	92.7
1.01	19.10	115	19.17	54.	54.	22.	92.7
1.01	19.20	116	19.33	48.	54.	22.	92.7
1.01	19.30	117	19.50	41.	53.	21.	92.7
1.01	19.40	118	19.67	36.	53.	21.	92.7
1.01	19.50	119	19.83	31.	51.	21.	92.7
1.01	20.00	120	20.00	27.	50.	21.	92.6
1.01	20.10	121	20.17	24.	49.	20.	92.6
1.01	20.20	122	20.33	21.	47.	20.	92.5
1.01	20.30	123	20.50	18.	46.	20.	92.5
1.01	20.40	124	20.67	16.	44.	19.	92.4
1.01	20.50	125	20.83	14.	42.	19.	92.4
1.01	21.00	126	21.00	12.	41.	18.	92.4
1.01	21.10	127	21.17	11.	40.	18.	92.3
1.01	21.20	128	21.33	10.	39.	18.	92.3
1.01	21.30	129	21.50	9.	38.	17.	92.2
1.01	21.40	130	21.67	8.	37.	17.	92.2
1.01	21.50	131	21.83	7.	36.	16.	92.1
1.01	22.00	132	22.00	7.	35.	16.	92.1
1.01	22.10	133	22.17	6.	34.	16.	92.0
1.01	22.20	134	22.33	6.	33.	15.	92.0
1.01	22.30	135	22.50	6.	32.	15.	91.9
1.01	22.40	136	22.67	5.	31.	15.	91.9
1.01	22.50	137	22.83	5.	30.	14.	91.8
1.01	23.00	138	23.00	5.	29.	14.	91.8
1.01	23.10	139	23.17	4.	28.	14.	91.8
1.01	23.20	140	23.33	4.	28.	13.	91.7
1.01	23.30	141	23.50	4.	27.	13.	91.7
1.01	23.40	142	23.67	4.	26.	13.	91.6
1.01	23.50	143	23.83	4.	25.	12.	91.6
1.02	0.00	144	24.00	4.	24.	12.	91.6

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1.02	.20	146	24.33	3.	23.	12.	91.5
1.02	.30	147	24.50	3.	22.	11.	91.5
1.02	.40	148	24.67	3.	22.	11.	91.4
1.02	.50	149	24.83	3.	21.	11.	91.4
1.02	1.00	150	25.00	3.	20.	10.	91.4
1.02	1.10	151	25.17	3.	20.	10.	91.3
1.02	1.20	152	25.33	3.	19.	10.	91.3
1.02	1.30	153	25.50	3.	19.	10.	91.3
1.02	1.40	154	25.67	3.	18.	10.	91.3
1.02	1.50	155	25.83	3.	18.	9.	91.2
1.02	2.00	156	26.00	3.	17.	9.	91.2
1.02	2.10	157	26.17	3.	17.	9.	91.2
1.02	2.20	158	26.33	3.	16.	9.	91.2
1.02	2.30	159	26.50	3.	16.	9.	91.1
1.02	2.40	160	26.67	3.	15.	9.	91.1
1.02	2.50	161	26.83	3.	15.	8.	91.1
1.02	3.00	162	27.00	3.	14.	8.	91.1
1.02	3.10	163	27.17	3.	14.	8.	91.1
1.02	3.20	164	27.33	3.	14.	8.	91.0
1.02	3.30	165	27.50	3.	13.	8.	91.0
1.02	3.40	166	27.67	3.	13.	8.	91.0
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1.02	4.30	171	28.50	3.	11.	7.	90.9
1.02	4.40	172	28.67	3.	11.	7.	90.9
1.02	4.50	173	28.83	3.	11.	7.	90.9
1.02	5.00	174	29.00	3.	10.	7.	90.9
1.02	5.10	175	29.17	3.	10.	7.	90.9
1.02	5.20	176	29.33	3.	10.	7.	90.9
1.02	5.30	177	29.50	3.	10.	6.	90.8
1.02	5.40	178	29.67	3.	9.	6.	90.8
1.02	5.50	179	29.83	3.	9.	6.	90.8
1.02	6.00	180	30.00	3.	9.	6.	90.8
1.02	6.10	181	30.17	4.	9.	6.	90.8
1.02	6.20	182	30.33	5.	9.	6.	90.8
1.02	6.30	183	30.50	8.	9.	6.	90.8
1.02	6.40	184	30.67	12.	9.	6.	90.8
1.02	6.50	185	30.83	18.	9.	6.	90.8
1.02	7.00	186	31.00	27.	9.	6.	90.8
1.02	7.10	187	31.17	39.	10.	7.	90.9
1.02	7.20	188	31.33	52.	11.	7.	90.9
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1.02	8.00	192	32.00	106.	21.	11.	91.4
1.02	8.10	193	32.17	118.	24.	12.	91.5
1.02	8.20	194	32.33	129.	27.	13.	91.7
1.02	8.30	195	32.50	139.	31.	15.	91.9
1.02	8.40	196	32.67	147.	35.	16.	92.1
1.02	8.50	197	32.83	154.	39.	18.	92.3
1.02	9.00	198	33.00	159.	44.	19.	92.5
1.02	9.10	199	33.17	164.	51.	21.	92.6
1.02	9.20	200	33.33	168.	58.	22.	92.8
1.02	9.30	201	33.50	172.	64.	24.	93.0
1.02	9.40	202	33.67	175.	71.	25.	93.2
1.02	9.50	203	33.83	177.	76.	27.	93.3
1.02	10.00	204	34.00	179.	82.	28.	93.5
1.02	10.10	205	34.17	181.	88.	29.	93.6
1.02	10.20	206	34.33	183.	93.	31.	93.8
1.02	10.30	207	34.50	184.	98.	32.	93.9
1.02	10.40	208	34.67	185.	102.	33.	94.0
1.02	10.50	209	34.83	186.	107.	34.	94.1
1.02	11.00	210	35.00	187.	111.	35.	94.3
1.02	11.10	211	35.17	188.	116.	36.	94.4

1.02 11.20 212 35.33 188. 120. 37. 94.5
1.02 11.30 213 35.50 189. 124. 38. 94.6
1.02 11.40 214 35.67 189. 129. 39. 94.7
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1.02 12.20 218 36.33 207. 144. 42. 95.0
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1.02 12.50 221 36.83 334. 165. 47. 95.4
1.02 13.00 222 37.00 419. 178. 49. 95.7
1.02 13.10 223 37.17 527. 196. 53. 96.1
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1.02 14.00 228 38.00 1219. 431. 93. 99.4
1.02 14.10 229 38.17 1361. 462. 104. 100.3
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1.02 15.00 234 39.00 1983. 1900. 145. 103.0
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1.02 15.40 238 39.67 2495. 2427. 148. 103.1
1.02 15.50 239 39.83 2731. 2637. 149. 103.2
1.02 16.00 240 40.00 3012. 2902. 150. 103.3
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1.02 16.20 242 40.33 3755. 3596. 154. 103.5
1.02 16.30 243 40.50 4184. 4015. 156. 103.7
1.02 16.40 244 40.67 4551. 4409. 158. 103.8
1.02 16.50 245 40.83 4811. 4712. 160. 103.9
1.02 17.00 246 41.00 4960. 4905. 161. 104.0
1.02 17.10 247 41.17 5003. 4991. 161. 104.0
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1.02 17.30 249 41.50 4859. 4909. 161. 104.0
1.02 17.40 250 41.67 4697. 4763. 160. 103.9
1.02 17.50 251 41.83 4496. 4577. 159. 103.9
1.02 18.00 252 42.00 4249. 4349. 158. 103.8
1.02 18.10 253 42.17 3966. 4079. 156. 103.7
1.02 18.20 254 42.33 3693. 3800. 155. 103.6
1.02 18.30 255 42.50 3450. 3544. 154. 103.5
1.02 18.40 256 42.67 3219. 3308. 152. 103.4
1.02 18.50 257 42.83 2986. 3076. 151. 103.4
1.02 19.00 258 43.00 2841. 2841. 150. 103.3
1.02 19.10 259 43.17 2499. 2596. 148. 103.2
1.02 19.20 260 43.33 2244. 2342. 147. 103.1
1.02 19.30 261 43.50 1990. 2087. 146. 103.0
1.02 19.40 262 43.67 1752. 1876. 144. 102.9
1.02 19.50 263 43.83 1527. 1678. 142. 102.8
1.02 20.00 264 44.00 1321. 1465. 140. 102.7
1.02 20.10 265 44.17 1133. 1264. 138. 102.6
1.02 20.20 266 44.33 965. 1082. 137. 102.5
1.02 20.30 267 44.50 817. 920. 135. 102.4
1.02 20.40 268 44.67 695. 781. 134. 102.3
1.02 20.50 269 44.83 593. 664. 133. 102.2
1.02 21.00 270 45.00 507. 588. 132. 102.2
1.02 21.10 271 45.17 434. 526. 131. 102.1
1.02 21.20 272 45.33 372. 517. 129. 102.0
1.02 21.30 273 45.50 319. 517. 127. 101.8
1.02 21.40 274 45.67 273. 510. 124. 101.6
1.02 21.50 275 45.83 233. 503. 120. 101.4
1.02 22.00 276 46.00 200. 485. 117. 101.1
1.02 22.10 277 46.17 174. 465. 112. 100.8

PEAK OUTFLOW IS 4991. AT TIME 41.17 HOURS

[illegible]

**RUNOFF SUMMARY, AVERAGE FLOW IN CUBIC FEET PER SECOND (CUBIC METERS PER SECOND)
AREA IN SQUARE MILES(SQUARE KILOMETERS)**

HYDROGRAPH AT		PEAK	6-HOUR	24-HOUR	72-HOUR	AREA
1	2	5005.	3061.	899.	455.	1.66
		(141.71)	(86.68)	(25.46)	(12.90)	(4.30)
ROUTED TO		4991.	3023.	874.	440.	1.66
		(141.33)	(85.60)	(24.76)	(12.47)	(4.30)

SUMMARY OF DAM SAFETY ANALYSIS

PLAN 1						
ELEVATION STORAGE OUTFLOW	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
	90.00	90.37	102.13			
	0.	3.	132.			
	0.	0.	528.			

***** 0.00 *****
 ***** FLOOD HYDROGRAPH PACKAGE (HEC-1) *****
 ***** DAM SAFETY VERSION JULY 1978 *****
 ***** LAST MODIFICATION 26 FEB 79 *****
 ***** 0000 *****

POW5OUT 14113 MAR 03,'81

FLOOD HYDROGRAPH PACKAGE (HLC-1)
DAM SAFETY VERSION JULY 1978
LAST MODIFICATION 26 FEB 79

PREVIEW OF SEQUENCE OF STREAM NETWORK CALCULATIONS

1
RUNOFF HYDROGRAPH AT 1
ROUTE HYDROGRAPH TO 2
END OF NETWORK

FLOOD HYDROGRAPH PACKAGE (HLC-1)
DAM SAFETY VERSION JULY 1978
LAST MODIFICATION 26 FEB 79

RUN DATE# 01/03/03.
TIME# 14.11.42.

POWDER MILL POND (00803)
INFLOW HYDROGRAPHY AND ROUTING
N.J. DAM INSPECTION

JOB SPECIFICATION									
NQ	MHR	NMIN	IDAY	INR	IMIN	METRC	IPLT	IPRT	INSTAN
290	0	10	0	0	0	0	0	4	0
		JOPER	NWT	LKOPT	YRADE				
		5	0	0	0				

MULTI-PLAN ANALYSES TO BE PERFORMED

RTIOS= .10 .20 .30 .40 .50
NPLAN= 1 RTIO= 5 LRTIO= 1

SUB-AREA RUNOFF COMPUTATION

COMPUTE HYDROGRAPH

ISTAG	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
1	0	0	0	0	0	1	0	0

HYDROGRAPH DATA

IHYDS	IUNG	TAREA	SNAP	TRSDA	IRSPC	RATIO	ISNOW	ISAME	LOCAL
1	2	1.66	0.00	1.66	.80	0.000	0	0	0

PRECIP DATA

SPFE	PMS	R6	R12	R24	R48	R72	R96
0.00	22.20	112.00	123.00	132.00	142.00	0.00	0.00

LOSS DATA

LROPT	STKR	DLTKR	RTIOL	ERAIN	STKR8	NTIOL	STRTL	CN8TL	ALSMX	RTIMP
0	0.00	0.00	1.00	0.00	0.00	1.00	1.00	.15	0.00	0.00

TC= 0.00 LAG= 1.60

RECESSION DATA
STRTQ= -2.00 ORCSN= 0.00 RTIOR= 1.00

MO.DA HR.MN PERIOD RAIN EXCS LOSS COMP Q MO.DA HR.MN PERIOD RAIN EXCS LOSS COMP Q
0 25.22 20.44 4.78 132061.
(641.)(519.)(121.)(3739.55)

HYDROGRAPH ROUTING

ROUTING COMPUTATIONS

ISTAQ	2	ICOMP	1	IECON	0	ITAPE	0	JPLT	0	JPRT	0	INAME	1	ISTAGE	0	IAUTO	0
ROUTING DATA																	
GLOSS	0.0	CLOSS	0.00	AVG	1	IRCS	0	ISAME	0	IOPT	0	IPHP	0	LSTR	0		
NSTPS NSTDL LAG AMSKK X TSK STORA ISPRAT																	
1	0	0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
STAGE	90.37	92.37	94.37	96.37	97.37	97.37	97.37	97.37	97.37	99.37	101.37	102.13	103.00	104.00	104.00	104.00	104.00
FLOW	0.00	41.00	115.00	211.00	266.00	266.00	266.00	266.00	266.00	430.00	502.00	528.00	1969.00	5023.00	5023.00	5023.00	5023.00

SURFACE AREA= 8. 8. 15. 17.
CAPACITY= 0. 16. 132. 162.
ELEVATION= 90. 92. 102. 104.

CREL SPWID COQW EXPW ELEV COOL CAREA EXPL
90.4 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0

DAM DATA
TOPEL COOD EXPD DAMWID
102.1 0.0 0.0 0.0

PEAK OUTFLOW IS 328. AT TIME 42.67 HOURS
PEAK OUTFLOW IS 859. AT TIME 42.00 HOURS
PEAK OUTFLOW IS 1494. AT TIME 41.33 HOURS
PEAK OUTFLOW IS 1997. AT TIME 41.33 HOURS
PEAK OUTFLOW IS 2496. AT TIME 41.17 HOURS

PEAK FLOW AND STORAGE (END OF PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
 FLOWS IN CUBIC FEET PER SECOND (CUBIC METERS PER SECOND)
 AREA IN SQUARE MILES (SQUARE KILOMETERS)

OPERATION	STATION	AREA	PLAN	RATIOS APPLIED TO FLOWS				
				RATIO 1	RATIO 2	RATIO 3	RATIO 4	RATIO 5
HYDROGRAPH AT	1	1.66	1	500.	1001.	1501.	2002.	2502.
	(	4.30)	(	14.17)	(28.34)	(42.51)	(56.69)	(70.86)
ROUTED TO	2	1.66	1	328.	859.	1494.	1997.	2496.
	(	4.30)	(	9.29)	(24.33)	(42.30)	(56.54)	(70.68)

SUMMARY OF DAM SAFETY ANALYSIS

PLAN 1									
		ELEVATION		INITIAL VALUE		SPILLWAY CREST		TOP OF DAM	
		STORAGE		0.		90.37		102.13	
		OUTFLOW		0.		3.		132.	
				0.		0.		528.	

APPENDIX 4

REFERENCES

APPENDIX 4

REFERENCES

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